INFLUENCE OF SUPPLY CHAIN RISK MANAGEMENT STRATEGIES ON PERFORMANCE OF FOOD AND BEVERAGE MANUFACTURING FIRMS IN KENYA

FRED ONGISA NYANG'AU

DOCTOR OF PHILOSOPHY

(Supply Chain Management)

JOMO KENYATTA UNIVERSITY OF

AGRICULTURE AND TECHNOLOGY.

2017

Influence of Supply Chain Risk Management Strategies on Performance of Food and Beverage Manufacturing Firms in Kenya

Fred Ongisa Nyang'au

A Thesis Submitted in Partial Fulfilment for the Degree of Doctor of Philosophy in Supply Chain Management in the Jomo Kenyatta University of Agriculture and Technology.

2017

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university

Signature .....…….… Date.....

Nyang'au Fred Ongisa

This thesis has been submitted for examination with my approval as the University supervisor.

Signature .....…….… Date.....

Dr. Gladys Rotich, PhD

JKUAT, Kenya

Signature .....…….… Date.....

Dr. Karanja Ngugi, PhD

KU, Kenya

DEDICATION

This thesis is dedicated to my late father Mwalimu Robert Nyang'au for his inspiration.

ACKNOWLEDGEMENT

I sincerely acknowledge all those involved for their contributions directly or indirectly to the success of this work. First, I appreciate the support I continue to receive from my family especially my dear wife, Emmy Cherotich. Secondly, I thank my supervisors Dr. Gladys Rotich and Dr. Karanja Ngugi for their guidance and support throughout this academic journey. I also recognise the support and contribution of JKUAT Nairobi CBD director, Entrepreneurship and Procurement Department (EPD) and my classmates. The Department of Trade, Kenya Association of Manufacturers (KAM), entrepreneurs and friends are also deeply appreciated.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

CFI	Comparative Fit Index
CMI	Chartered Management Institute
CPCA	Categorical Principal Component Analysis
DC	Distribution centre
F&B	Food and Beverage
GFI	Goodness-of-Fit Index
GDP	Gross Domestic Product
ICT	Information Communication Technology
IFC	International Finance Cooperation
ILO	International Labour Organisation
KAM	Kenya Association of Manufacturers
KNBS	Kenya National Bureau of Statistics
MDG	Millennium Development Goals
NFI	Normed-fit Index
NNFI	Non-Normed Fit Index
OECD	Organisation for Economic Cooperation and Development
RMSEA	The Root Mean Square Error of Approximation

SCM	Supply Chain Management
SCR	Social Corporate Responsibility
SCRM	Supply Chain Risk Management
SEZ	Special Economic Zones
TLI	Tucker-Lewis Index
SRMR	The Standardized Root Mean Square Residual
WLSMV	Weighted Least Squares with Mean and Variance Adjusted

OPERATIONAL DEFINITION OF TERMS

Agility- Agility is mostly understood as the ability of a supply chain to rapidly respond to change by adapting its initial stable configuration (Christopher *et al.,* 2012; Bernades & Hanna, 2009).

Collaboration- Is the agreement between or among supply chain actors to integrate their resources for mutual benefits. Firms need to develop routines and practices that lead to collaboration among partners (Chopra *et al*., 2007; Blackhurst, Dunn & Craighead, 2011). Collaboration involves information-sharing, information technology and supply chain visibility

Contingency planning- According to Skipper and Hanna (2009), contingency planning is a special type of planning that provides firms with a blueprint for managing risk related to unknown occurrence.The aim of contingency planning is to minimize potential loss and save valuable resources in the event of a disruption by identifying, prioritizing, and safeguarding resources that need protection.

Cost- Is an important metric for assessing the efficiency of the SC, since one of the objectives of SC management is achieving the minimum total SC cost. This includes the total costs for order management, storage and commissioning, inventory management and transport (Chopra*et al*. 2007; Wong & Wong, 2008).

Delivery- It is one of the key attributes of performance according to SCOR model. It measures the supplier's ability to predictably complete processes as promised. It is measured by perfect order fulfilment and demonstrates the degree to which a supplier is able to serve its customers within the promised delivery time. Firms should meet

delivery deadlines accurately, timely and in full (Gligor & Holcomb, 2012).

Flexibility- Is the ability of firms to be more innovative, dynamic and responsive to changes and challenges (Gligor & Holcomb, 2012; Tang & Tomlin, 2009). The flexibility strategies include contingency planning, postponement and agility.

Information sharing- Tomlin (2009) has described information sharing as the synchronization of information across the supply chain to ensure seamless business processes such as material, information and financial flows to improve supply chain performance

Postponement- Is the ability to delay the actual commitment of resources and activities to maintain flexibility and delay incurring costs. There are three categorizes of postponement: time postponement, form postponement, and place postponement (Liu, Lin & Hayes, 2010).

Quality- Level refers to how the orders are executed, the reliability of the service performance including the quality of the shipment and the quality of the delivery (Chopra *et al.,* 2007)

Risk avoidance- is the process of avoiding an activity, any chance of loss is eliminated.Risk avoidance may also be seen as the elimination of hazards, activities and exposures that can negatively affect an organization's assets (Khan & Burnes, 2007).

Supplier base rationalisation strategy- Involves supplier management practices such as supplier rationalization, supplier contracts and establishing long term relationships with suppliers (Christopher & Lee, 2005; Sheffi, 2006; Musa & Tang, 2012)

Supply chain performance measurement- Is the process of qualifying the efficiency and effectiveness of the supply chain based on goals and measures such as SC cost, quality and delivery (Wong & Wong, 2008; Bigliardi & Bottani, 2014).

Supply chain risk control- Is the process of taking proactive steps to reduce the identified risks where possible and putting procedures, rules or policies in place to minimize the residual risk or to reduce the severity of such a loss (Hepenstal & Campbell, 2007; Son & Orchard, 2012).

Supply chain risk management strategies- In this study, SCRM strategies are practices that F&B manufacturing firms use to reduce or control supply chain risks. These strategies are flexibility, collaboration, supply base strategies, control strategies and avoidance strategies(Skipper & Hanna, 2009; Gligor & Holcomb, 2012; Lockamy, 2014)

Supply chain visibility- Is the ability to see from one end of the pipeline to the other. Visibility implies a clear view of upstream and downstream inventories, demand and supply conditions, and production and purchasing schedules for example (Christopher & Holweg, 2011).

supply chain vulnerability- Can be defined as an exposure to serious disturbance, arising from risks within the supply chain as well as risks external to the supply chain supply chain vulnerability is a function of certain supply chain characteristics and that the loss a firm incurs is a result of its supply chain vulnerability to a given supply chain disruption (Waters, 2007; Juttner & Maklan 2011)

ABSTRACT

The food and beverage industry has a special role in expanding economic opportunity because it is universal to human life and health. The industry strongly influences entire value chains from growers to consumers. Despite this huge influence, the complexity of business transactions, technological advances, globalization, speed of product cycles, and the overall pace of change have made food and beverage manufacturing in Kenya more complex, dynamic and increasingly uncertain, fragile and vulnerable to disruptions. In this context, adopting proactive strategies is needed for dealing with supply chain risks and vulnerabilities for securing supply chain systems to be responsive and effective. This study focused on evaluating the influence of supply chain risk management strategies on supply chain performance of food and beverage manufacturing firms in Kenya. The supply chain risk management strategies include flexibility, supply chain collaboration, supply base rationalisation strategy, risk control and risk avoidance. The study variables were studied with the aim of answering the question: Do supply chain risk management strategies influence supply chain performance of food and beverage manufacturing firms in Kenya? This was an explanatory survey study on the supply chain risk management strategies in food and beverage manufacturing in Kenya. The target population was all food and beverage manufacturing firms in Kenya. The research population was 187 food and manufacturing firms drawn from a KAM directory using a census survey method. A five-point Likert scale questionnaire was administered to seni or-level managers with the knowledge of supply-chain and logistics functions. Both descriptive and inferential analysis was done using SPSS and structural equation modelling (SEM) R-Lavaan 0.5-20 to find out the influence of supply chain risk management strategies on supply chain performance of food and beverage manufacturing firms in Kenya. The study established that supply chain risk management strategies have influence on performance of F& B manufacturing firms. This study concludes that the most important SCRM strategies on the performance of a F& B manufacturing firm are the SC avoidance strategies. The second most influential SCRM strategies on the performance of a F&B manufacturing firm are SC control strategies followed by SC flexibility strategies and SC base rationalisation strategies respectively. Supply chain collaboration strategies have the least influence on F&B manufacturing firms. The study recommends, among others, that the study F& B manufacturing firms must recognize SC flexibility, collaboration and supply base rationalization a score supply chain risk management strategies, and that achieving world-class performance depends on managing supply chains risks. Firms should support supply chain risk management with dedicated employees, resources, investments, and best practices to ensure that firms supply chain efforts satisfy customers in the most productive, cost-effective way possible. Future research may be carried out to establish the capabilities and tailored strategies necessary for building supply chain resilience in businesses and their impact on financial performance. Researchers could also establish the role of risk awareness culture, organizational structure (centralized and decentralized, standardized and customization SC) on organizational performance.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Historically, the growth in manufacturing has been a key element in the successful transformation of most economies that have seen sustained rises in their per capita incomes (World Bank, 2014). In most of Africa, performance in manufacturing has been particularly poor over the last decades (World Bank, 2014).In Kenya, which ranks 17th from the top, manufacturing accounts for 10.6 % of the GDP, which is low compared to most middle income countries, yet it is the most manufacturing-intensive economy in eastern Africa. According to Republic of Kenya (2014), the manufacturing sector in Kenya is a potential major source of growth. The role of the manufacturing sector in Vision 2030 is to create employment and wealth and transform Kenya into a middle-income country. The government's goal is for manufacturing to account for 20% of GDP by 2030, nearly twice today's level, at 10.6% (RoK, 2014).Achieving these goals will require addressing some outstanding supply chain constraints on manufacturing activity. As in many emerging markets in Africa, high supply chain risks are a challenge.

1.1.1 Supply Chain Risk Management

The complexity of business transactions, technological advances, globalization, speed of product cycles, and the overall pace of change have increased uncertainty, fragility, vulnerability and disruptions facing organizations (Wagner & Bode 2006; Coleman 2006). For these reasons, supply chain risk management (SCRM) is becoming an integral part of risk management in most organisations (Tomlin, 2006; Ghagde, Dani & Kalawsky, 2013). A supply chain consists of all parties involved, directly or indirectly in fulfilling a customer request. The supply chain includes not only the manufacturer and suppliers, but also transporters, warehouses, retailers, and even customers themselves (Chopra, Meiindl & Kalra, 2007). According to Mentzer, Min and Bobbitt, (2004),

supply chain is a set of three or more entities- organisations or individuals- directly involved in the upstream and downstream flows of products, services, finances and /or information from a source to a customer. Other authors such as Monczka, Trent and Handfield (2004) described supply chain as encompassing all activities associated with the flow of goods from the raw materials stage through to end users as well as the associated information flows both up and down the supply chain.

Supply chains have become more susceptible to unpredictable events that could lead to supply disruptions and undermine supply chain performance (Kihyun, 2012). Globally, no other industry is more dependent on public confidence than the food and beverage industry which in contemporary times exhibits more vulnerability to disruptive risks (Roth, Tsay, Pullman & Gray, 2008).According to Sheffi (2005) without appropriate strategies in place to fundamentally deal with these risks, companies could become vulnerable to disruptions. In the literature, supply chain risks are shown to influence Supply chain performance. Kern *et al*. (2012) focused on the process dimensions of upstream SCRM and showed that competent SCRM in companies leads to superior performance. Papadakis (2006) investigated vulnerability of supply chains empirically by analyzing and comparing stock performance of firms facing supply disruptions. The study indicated that a supply chain with a high level of risk cannot be efficient. Schmitt (2011) analytically models supply disruptions in a multi-echelon supply chain and numerically demonstrates the effectiveness of supply chain risk management strategies. Hendricks and Singhal (2005), in an empirical study, report that supply chain disruptions can lead to a company's long-term negative financial performance, especially in terms of shareholder wealth and stock returns when compared to an industry benchmark.

Srinivasan *et al*. (2011) investigated the relationship between buyer-supplier partnership quality and supply chain performance along with the moderating role of supply chain risks on this relationship. The findings show the presence of a positive relationship between buyer-supplier partnership quality and supply chain performance. The study also indicated that this positive relationship is moderated significantly by the presence of

demand side risk and environmental uncertainty thereby implying the need for supply chain managers to form close relationships with their suppliers based on mutual trust and transparency as this will mitigate the demand side risks. However, according to Wagner and Bode (2008) supply chain risks only partially explain the variance in supply chain performance, and there is no significant relationship between regulatory, legal and bureaucratic risks, infrastructure risks, and catastrophic risks and supply chain performance. Wagner and Bode (2008) investigated the impact of various types of supply chain risk on supply chain performance. The findings show supply side risk and demand side risk as the only significant predictors of supply chain performance.

Supply chain risk management is assumed to either proactively mitigate or reactively respond to risks (Tomlin, 2006; Ghagde, Dani & Kalawsky, 2013). The conceptualisation of supply chain risk management incorporates supply chain resilience and supply chain vulnerability (Sorensen, 2005). According to Ponomarov and Holcomb (2009) supply chain resilience is an important part of SCRM. Supply chain resilience means the capability of companies to anticipate, identify, react and learn from incidents (Craighead, Blackhurst, Rungtusanatham, & Handfield, 2007; Sheffi, 2006). Christopher (2005) stated that resilient processes are agile and are able to change quickly. The adaptive nature of capability allows the supply chain to recover after being disrupted, returning to its original state or achieving a more desirable state of supply chain operations. Christopher's conceptualization of a resilient supply chain includes elements such a supply base strategy, collaborative planning, visibility, and developing supply chain resilient culture considerations into decisions.

Peck (2005) defined supply chain vulnerability as exposure to serious disturbance arising from risks within and external to the chain. According to Waters (2007), vulnerability reflects the susceptibility of a supply chain to disruption, and is a consequence of risks in it. Juttner and Maklan (2011) further refer to supply chain vulnerability as the propensity of risk sources and drivers to outweigh risk-mitigating strategies, thus causing adverse consequences in the chain and

jeopardising its ability to effectively serve the end customer market. Therefore, companies may reduce their vulnerability by reducing the probability of a disruption or by increasing the company's resilience, i.e. its ability to recover from a disruption (Sheffi, 2006). Supply chain risk management, therefore, aims to identify the potential sources of risk, and to implement appropriate actions to avoid or contain supply chain vulnerability (Manuj & Mentzer, 2008a; Ghagde *et al*., 2012).

Carter and Rogers (2008) defined SCRM as the ability of a firm to understand and manage its economic, environmental, and social risks in the supply chain. According to Kouvelis, Chambers and Wang (2006), SCRM is managing the uncertainty of demand, supply and costs. Wagner and Bode (2008) classified risks into five classes: demand side; supply side; regulatory, legal and bureaucratic; infrastructure; and catastrophic. While the first two risk source categories deal with supply-demand coordination risks that are internal to the supply chain, the latter three focus on risk sources that external to the chain. Chopra and Sodhi (2004) present nine risk categories, which include disruptions, delays, systems, forecast, intellectual property, procurement, receivables, inventory and capacity. However, based on the consensus in the literature that a supply chain at its simplest degree of complexity comprises at least three entities: a company, a supplier and a customer (Mentzer *et al*., 2001), it has been suggested that any approach to managing risks in the supply chain should adopt the same cross-company, supply chain orientation (Ponomarov, 2012; Yang & Yang, 2012). For F&B manufacturing firms it is more difficult to manage risks since the organisations are faced with more stringent standards (Samir & Aman, 2010).

1.1.2 Food and Beverage Manufacturing Sector

The Kenyan food-processing sector remains the largest component of the manufacturing industry (KAM, 2015). This sector is the most important and largest comprising of over 187 businesses, encompassing everything from small family organisations to large

multinational companies (KAM, 2015). Kenya National Bureau of Statistics (KNBS) report that in 2014, the sector generated over a third (33.4 %) of the total manufacturing production, and provided 33.5 % of jobs in the manufacturing sector. According to KAM (2015) the Kenya Food and Beverage sector encompasses a range of sub-sectors: alcoholic beverages and spirits, cocoa, chocolate and sugar confectionaries, dairy products, juices, water and carbonated soft drinks meat and meat products, vegetable oils.

Food and beverage supply chains are complex in nature and may be subject to risks such as quality, cost, lead time and inventory due to internal and external factors (Samir & Aman, 2010; WHO, 2008). Peck (2006) suggested three issues which create complexity in the food supply chain. These issues focus on lean supply chains and the effect of less stock when disruption occurs, reduced control over the process due to global supply chains and the difficulty in allocating resources for risk mitigation based on probabilities the risk will occur. According to Samir and Aman, (2010) within food supply chains, two types of risk scenarios were identified which needed different responsive management strategies. Firstly, there are risks which are concerned with food safety, as well as maintaining a secure supply of food and secondly, all other risks which affect the supply chain but do not have a direct impact on food safety. The involvement of these types of risks is primarily the firm and its direct supply chain partners. These risks include transportation strikes, loss of power, flooding (Peck, 2006).

It is clear that there are several risks facing the food and beverage manufacturing firms in Kenya. These constraints include cut throat competition, unpredictable demand patterns, changing customer preferences and others (Chopra *et al*., 2007). These vulnerabilities require businesses to respond to specific customer demands in order to have a competitive advantage. Thus, the role of supply chain risk management (SCRM) in gaining that advantage through supply chain performance is recognized (Juttner & Maklan, 2011).

1.1.3 Supply Chain Performance Measurements

Supply chain performance measurement is the process of qualifying the efficiency and effectiveness of the supply chain (Wong & Wong, 2008). Supply chain performance measurement includes multiple dimensions including financial and non-financial metrics describing costs, capacity, lead times and service levels (Bigliardi & Bottani, 2014). SCM could be measured at various management or operation levels. Strategic level measures influence top management decisions and also very often reflects investigation of broad based policies and level of adherence to organisational goals(Chopra *et al*., 2007).. The tactical level deals with resource allocation and measuring performance against targets to be met in order to achieve results specified at the strategic level. At the operational level, metrics are relevant for day to day business. The main metrics of a firm's operation performance are based on (1) cost; (2) quality; (3) flexibility; and (4) delivery.

1.2 Statement of the Problem

The food and beverage industry has a special role in expanding economic opportunity because it is universal to human life and health (Roth *et al*., 2008). The food and beverage manufacturing industries account for approximately 50% of manufacturing production turnover which is about 2.8% of GDP (KAM, 2015).Despite this huge influence, the food and beverage supply chain is increasingly in the spotlight for safety scares, recalls and disruptions. Public focus on these issues has also grown following increasing consumer concerns. Supply chain risks are resulting in increased variations in capacity constraints, increased costs of operations or from breakdowns, quality problems, delays in delivery or even natural disasters at the supplier end (Blackhurst, Scheibe & Johnson, 2008; Vaaland & Heide, 2007). Firms that were affected by supply chain risks suffered from poorer supply chain performance (Wilson 2007, Wagner & Bode, 2008). Furthermore, supply chain risks can hurt the firm's financial performance and lead to lower sales, asset utilisation, or profitability (Hendricks & Singhal, 2005). Supply chain disruptions cause a sales fall of 7 %, a down of an operating income of 42

% and a fall of return on assets of 35 % and an announcement of supply chain disruptions causes a shareholder return between 7 and 8 % (Hendricks & Singhal, 2005).

In the context of the Kenya food and beverage industry, the challenges are diverse: short shelf life and perishability, competition from imports, increased consumer safety and health concerns (RoK, 2014). The short shelf life and perishability of food and beverage products along with the challenges of infrastructure pose a serious threat to F& B manufacturing firms. Secondly, consumer concerns on environmental and welfare issues have put further pressure on manufacturers to ensure food products are produced sensitively and safely. The other problem is the slow growth in the overall food and beverage industry due to major increase in Kenyan imports of consumer-ready foods (KAM, 2015). The value of food and beverage imports is projected to continue increasing over the next five years to over $ 400 million (World Bank, 2014). Local food and beverage manufacturers are no longer the dominant source of supply to consumers. A number of F & B manufacturing firms are closing down creating massive loss of jobs resulted in slower economic growth (KAM, 2015).According to Samir and Aman (2010), management of food and beverage supply chains requires speed, accurate and intelligent decision making to cope with the complex dynamic competition and uncertainty from external demands and variables. In order to attain that, several strategies exist towards supply chain risk management (Tang & Musa, 2011).

A number of studies have focused on supply chain risk management in different industries, such as retail industry (Oke & Gopalakrishnan, 2009), toy industry (Johnson, 2001), personal computer industry (Papadakis, 2006), consumer electronics industry (Sodhi & Lee, 2007) and aerospace supply chain (Sinha, Whitman & Malzahn, 2004).While there has been a significant amount of research conducted in the area of supply chain resilience, there has been relatively little reported about the influence of supply chain risk management strategies on supply chain performance in food and beverage manufacturing firms. It was, therefore, the purpose of this study to find out the

influence of supply chain risk management strategies on performance of F&B manufacturing firms in Kenya.

1.3 General Objective of the Study

The general objective of this study was to evaluatethe influence of supply chain risk management strategies on the supply chain performance of food and beverage manufacturing firms in Kenya.

1.3.1 Specific Research Objectives

The specific objectives of the study were:

1) To examine the influence of supply chain risk flexibility strategies on performance of food and beverage manufacturing firms in Kenya
2) To assess the influence of supply chain risk collaboration strategies on performance of food and beverage manufacturing firms in Kenya
3) To explore the influence of supply base rationalisation strategies on performance of food and beverage manufacturing firms in Kenya
4) To find out the influence of supply chain risk control strategies on performance of food and beverage manufacturing firms in Kenya
5) To examine the influence of supply chain risk avoidance strategies on performance of food and beverage manufacturing firms

1.4 Research Hypotheses

The study sought to test the following hypotheses:

1) H_1: Supply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms in Kenya
2) H_1: Supply chain risk collaboration strategies have positive influence on performance of food and beverage manufacturing firms in Kenya

3) H_1: Supply baserisk rationalisation strategies have positive influence on performance of food and beverage manufacturing firms in Kenya
4) H_1: Supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firms
5) H_1:Supply chain risk avoidance strategies have positive influence on performance of food and beverage manufacturing firms in Kenya

1.5 Significance of the Study

Manufacturing especially F& B industry is pivotal in the development process making significant contribution to the national and global economy (IFC, 2006; ILO, 2008). According to ILO (2008), there is a strong correlation between large manufacturing sector and per capita growth of growth domestic product (GDP).World Bank, OECD and Kenya Economic Survey Report 2014 indicate that the growth of the country's economy will depend on job creation through manufacturing. The survey stated that out of the new jobs created, 33.5 % were in F& B manufacturing. For better performance, these organizations need to form strategies that not only guarantee their survival, but also ensure their sustained competitive advantage. Supply chain risk management strategy becomes a critical component of meeting customer requirements thereby gaining a competitive advantage.

The study will generate empirical and theoretical body of knowledge which would be useful to scholars and supply chain practitioners. The research will identify areas for further research and this would be useful to supply chain management students. It is hoped that this study on the SCRM strategies in F&B manufacturing will help the entrepreneurs, policy makers, financiers, scholars and researchers to improve the performance of these businesses. Understanding these risks might also inspire more up take of insurance policies in the industry.

1.6 Scope of the Study

The study was focused on finding out the influence of supply chain risk management strategies on supply chain performance of F& B manufacturing firms in Kenya. The study targeted 187 KAM registered F&B manufacturing firms in Kenya. It involved the identification of F& B manufacturing firms, supply chain risk management strategies inherent in the management of those firms. A performing firm was limited to quality, cost, delivery and flexibility. The study did not determine the effectiveness of any SCRM modelling. It was not be pragmatic to consider all the F& B manufacturing firms in the country. However, the sample frame is representative for generalization.

1.7 Limitation of the Study

This research is not without limitations. First, the sample size is small based on the KAM registered F& B manufacturers. Moreover, this research has been developed primarily with F& B manufacturing firms in mind, and no consideration regarding SCRM strategies in other sectors in Kenya. This may limit the opportunity to generalize the findings to other local SME and other manufacturers. Further research should test our results using unregistered F& B manufacturing firms. Another limitation of our study is the issue of single respondents. However, we believe that our results are not affected by this issue. First, the respondents chosen for the survey were senior managers who were knowledgeable about their firm and supply chain risk management activities. Nevertheless, this explanatory study has provided considerable insight into the key variables for a successful implementation of SCRM strategies designed to minimize risk exposure in the event of a supply chain disruption and enhance SC performance

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter consists of theoretical literature related to the study. Both theoretical and empirical literature show the research gap which the study sought to fill. In particular, literature review addresses: supply chain risk management, SCRM strategies and food and beverage manufacturing. Apart from the literature review, the chapter contains the relationship between dependent and independent variables as developed in the conceptual framework and the chapter summary.

Literature review is a critical look at the existing research that is related to the study (Kombo & Tromp, 2006). The review of literature sharpens and deepens the theoretical foundation of the research. According to Sekaran (2006) literature review provides a framework for relating new study to previous studies. The author further argues that it is a means of demonstrating a researcher's knowledge about a particular field of study. Similarly Saunders, Lewis and Thornhill (2009) argued that literature review informs of the influential researches in the field.

2.2. Theoretical Framework

The main objective of this section is to conceptualise the influence of SCRM strategies on supply chain performance of food and beverage manufacturing in Kenya using contingency theory, relational view, supply chain network theory, learning theory, theory of constraints (TOC) and resource-based view (RBV). Kombo and Tromp (2006), defines a theoretical framework as a collection of interrelated ideas based on theories.

2.2.1 Contingency Theory

Contingency theory suggests that a series of optimal decisions within a firm are contingent (dependent) upon internal and external factors and that the fit between organizational structure and process will lead to better performance. According to Kihyun (2011) contingency theory has two underpinning assumptions: first, there is no one best way to organize the appropriate form depends on the kind of task or environment one is dealing with and secondly management must be concerned with achieving alignments and good fits. The ability to adopt and implement practices that reduce the effects of harmful events depends on the extent to which firms perceive and react correctly to all forms of unexpected supply chain risks (Fawcett, Ogden, Magnan & Cooper, 2006; Volker, Grotsch & Schleper, 2013).Contingency theory perspective has been adopted in supply chain management studies (Kihyun, 2011; Buttermann, Germain, & Lyer, 2008; Volker *et al*., 2013). This study identifies three types of risk and several flexible risk management strategies such as postponement and contingency planning,

This strategy allows food and beverage manufacturers to react to unforeseen events such as short delivery delays, uncertain demands as well as natural disasters. According to Liu *et al*. (2010) firms that achieve higher levels of flexibility and agility significantly outperform their less flexible counterparts. Flexible firms are more innovative, dynamic and responsive to changes and challenges (Gligor & Holcomb, 2012; Tang & Tomlin, 2009). Flexibility positively impacts its ability to enhance comparative performance relative to leading industry competitors. Nembhard *et al*. (2005) developed a supply chain model in which a manufacturing firm can have the flexibility to select different suppliers, plant locations, and market regions. The researchers showed that flexibility is significant for supply chains that face demand and supply risks since flexibility helps a firm reallocate resources quickly and smoothly in response to change. In volatile and uncertain environments, dynamic capabilities such as flexibility can be harnessed to achieve growth. Dynamic capabilities are defined as the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and

threats, to make timely and market oriented decisions, and to change its resource base (Barreto, 2010).

Agility is mostly understood as the ability of a supply chain to rapidly respond to change by adapting its initial stable configuration (Christopher, Peck & Towill, 2006; Bernades & Hanna, 2009). Agile paradigm favours high availability and responsiveness to changes in product mix and volume (Christopher *et al.,* 2006; Urciuoli, 2010) being fast (Liu, Lin & Hayes, 2010). According to Bernades *et al*. (2009) agility comprises of all kind of changes. Nag, Han and Yao (2013) viewed agility as comprising of two main factors: responding to changes in proper ways and due time, and exploiting changes and taking advantage of changes as opportunities to survive and prosper in a competitive environment. Liu *et al*. (2010) regarded the main capabilities of an agile production system as the ease with which the system can change between products, and the ability to introduce new products without investments.

Postponement is the ability to delay the actual commitment of resources and activities to maintain flexibility and delay incurring costs (Li, Lin, Wang & Yan, 2006). According to Choi, Narasimhan and Kim (2012), there are three categorizes of postponement: time postponement, form postponement, and place postponement. Time postponement refers to the movement of goods from manufacturing plants only after customer orders are received (Bessant, 2008). Form postponement refers to determining the form and function of products. Form postponement includes labeling, packaging, assembly, and manufacturing. The extent of form postponement depends on demand customization, component costs, product life cycle, and product modularity (Choi & Krause, 2006). Place postponement refers to positioning upstream inventories in the manufacturing process. Tang (2006) has argued that postponement is a robust demand management strategy that leads to supply chain efficiency and supply resilience. The strategy enables food and beverage manufacturers to better manage risks by delaying resources and activities. Postponement is an effective strategy in enhancing supply chain efficiency when facing uncertain demands for diverse products.

According to Skipper and Hanna (2009), contingency planning is a special type of planning that provides firms with a blueprint for managing risk related to unknown occurrence. Contingency planning is significant to achieving flexibility (Ponomarov, 2012). Contingency planning includes increasing production at alternative locations, temporarily switching transportation, and shifting customer demand to alternative products (Tang & Tomlin, 2009).The contingency plan must be specific in terms of time and complete response to risks. The process of planning include risk assessment, risk evaluation and management, relationship management, first response, security, operations, stability, subsequent stages of response, and performance evaluation (Skipper & Hanna, 2009). Sheffi (2006) has suggested that contingency planning should describe and define the roles, procedures, duties, and responsibilities of key players in a firm to significantly reduce unexpected disruptions. In view of contingency theory, the first hypothesis evaluated, measured and tested in this study is as follows:

Hypothesis: Supply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms.

2.2.2 Relational Theory

Dyer and Singh (1998) offer a theory that explains competitive advantage and superior performance by focusing on dyads and networks of companies as units of analysis. The theory proposes that the greater the partners' investment is in: inter-firm knowledge-sharing routines; and relation-specific assets, the greater the potential will be for relational rents. According to Blackhurst, Dunn and Craighead (2011) relational competencies such as defined communication networks, developed supplier relationship management programs and monitoring systems are positively related to supply chain resilience. In this research, the relational view is the basis to understand how superior relational competencies can improve supply chain risk management.

Supply chain relations are based on integration, coordination and collaboration across the supply chain from the customers to the suppliers (Swink, 2006). According to

Chopra *et al*. (2007), collaboration is the agreement between or among supply chain actors to integrate their resources for mutual benefits. According to Musa, Wei and Tang (2012), firms need to develop routines and practices that lead to collaboration among partners. The main pillars of a collaborative relationship are trust, transparency and faith (Chopra *et al*., 2007).According to Sodhi and Tang (2012), a supply chain is fully coordinated when all decisions are aligned to accomplish common objectives. Lack of coordination will result in distortion of demand, (bullwhip effect) increase manufacturing cost, inventory cost, replenishment lead time, transportation cost, labour cost, decrease in efficiency, profit, information distortion (Paik &Bagchi, 2007).The collaborative supply chain has therefore become crucial in reducing supply chain risks(Tang, 2006).Arshinder and Deshmukh (2007) argued that sharing of information between supply chain members helps to substitute information with inventory and lead time, reduces the supply chain costs, reduces the demand variability, enhances responsiveness and improves the service level. There is a positive relationship between collaboration and performance (Breuer, Siestrup, Haasis & Wildebrand, 2013). Collaboration with suppliers and customers when responding to risk as well as redesigning products and processes gives firms an advantage through increased information flow, reduced uncertainty, improved quality and increased profitability (Sheffi & Rice, 2005; Richie & Brindley, 2007).

Mitchell and Nault (2007) have argued that synchronized business processes such as material, information and financial flows improve supply chain performance thus leading to business growth. Collaborative SC relies on the desire to share information and collaborative management. Effective information sharing among partners is a key determinant in reducing internal and external risk in the supply chain environment (Christopher, Mena, Khan & Yurt, 2012; Tang, 2006) Inter-organisational informational system (IOS)-a SC informational infrastructure- can disseminate real time demand and supply information throughout the supply chain thus reducing risks. Some of the infrastructure necessary include, message-based systems that transmit information to partner technologies such as fax, e-mail, electronic data interchange (EDI) or extensible

markup language (XML). Electronic procurement hubs, portals or marketplaces that facilitate purchasing of goods or services electronically promote partnerships (Tang & Zimmerman, 2013). Also important is the collaborative planning, forecasting and replenishment (CPFR) systems, vendor-managed inventory (VMI), efficient consumer response (ECR) and quick response.

Visibility within the supply chain refers to knowing where inventory is at any moment from the producer to the final destination (Christopher *et al.,* 2012). Supply chain visibility is also actionable information that can help support customers and be applied to myriad points along the supply chain from supplier to service provider to end customer—to remove redundancies and improve processes to give a firm a competitive advantage (Musa *et al*., 2012).Supply chain visibility can be improved through the use of information technology (IT). Using IT data solutions, trading partners and customers can securely see what's happening across the entire supply chain. According to Li, Lin, Wang and Yan (2006) supply chain visibility has the following advantages: it shows you real-time order, inventory and shipment information, systemically monitors perishables and reduces inventory loss from expired goods, reduces costs associated with expedited delivery, lower inventory levels and safety stocks, improves customer service, while raising productivity of customer service representatives and achieves faster time-to-market for new product (Musa *et al*., 2012). Drawing from relational view and owing to the fact that risks cannot be avoided completely, and also that supply chains are only as resilient as their most sensitive link in the chain, the study hypothesized thus;

Hypothesis: Supply chain risk collaboration strategies have positive influence on performance of food and beverage manufacturing firms.

2.2.3 SC Network Theory

Previous empirical research into real-world networks has recognised seemingly universal network properties (Bullmore & Sporns, 2009). These properties are: a short characteristic path length, a high clustering coefficient and the presence of a power law

connectivity distribution (Baraba´si, 2009). According to Hearnshaw and Wilson (2011), a supply chain can be modelled as a network by a set of "nodes" that represent autonomous business units as firms who are able to exercise sovereign choices, and a set of "connections" that link these firms together for the purposes of creating products or services. The linkages between firms represent exchange relationships and the underlying contract if present. The critical connection types are the presence of contracts and various flow types such as material flows, information flows and financial flows. Network theory is descriptive in nature and has primarily been applied in SCM to map activities, actors, and resources in a supply chain. The focus has been on developing long-term, trust-based relationships between the supply chain members. Examples of issues include buyer-supplier relationships, third party logistics, and management roles in supply networks (Gunasekaran, Lai & Cheng, 2008).

Supply management is widely acknowledged as strategic for companies, because they contribute to build and to maintain a competitive advantage (Hsu, Kannan, Leong & Tan, 2006; Chopra *et al*., 2007). Supply management has become more critical because there is an increasing dependence on suppliers. The dependence makes companies highly exposed to supply risks. According to Tang (2006) supply management should have a positive impact on the mitigation of the supply chain risks. Many researchers have posited several supply base strategies that can be used to reduce supply chain risks. These include an extended usage of flexible contract agreements, inspections to qualify suppliers and may be even combined with make and buy strategies to split production across different factories (Sheffi, 2006), selecting dual rather than single sourcing (Wieland, 2013), building trust in relationships (Srinivasan, Mukherjee & Gaur, 2011), managing risk in a proactive manner and finding a balance and alignment between benefits gained from and costs of risk management (Paik & Bagchi, 2007), risk sharing through sourcing relationships (Hsu *et al.,* 2006) by establishing a close relationship with single source suppliers and instituting less close relationships with a number of different suppliers in order to spread risks (Sheffi & Rice, 2005), and determining a

number of technological methods to discover, recover and redesign the supply chain (Blackhurst *et al*., 2011).

It has been recognized that the diversification of suppliers is a strategy to handle disruptions. The access to a wider supply base enables firms to inject in supply chains additional production lines and quickly shift volumes and production in case of a disruption (Sheffi, 2006; Tang, 2006; Tomlin, 2006; Tørhaug, 2008). By diversifying the portfolio of suppliers, risk is spread across multiple players, therefore decreasing the impact any single player can have on the supply stream (Manuj & Mentzer, 2008b). Adding another supplier decreases the expected return, but in turn lowers the risk variance and deviation from the mean (Musa & Tang, 2012).

Supplier selection strategy becomes one of the most important practices in supply chain risk mitigation (Hsu *et al*., 2006) Supplier selection is done after the firm has decided on either single sourcing or multiple sourcing. Supplier selection should be based not only on the price of the acquisition, but also on a wide range of criteria such as quality, organizational parameters and capabilities with a view to reducing supply chain risk (Micheli, Cagno & Zorzini, 2008).Supplier selection based on quality, pricing, delivery and performance of product have significant relationship with four elements of customer satisfaction -product quality, product variety, delivery service and competitive pricing- and firm performance (Ponomarov, 2012).

Building collaborative supply base with supplier is the key element in supplier strategy. Chopra *et al.* (2007) referred to trust, mutuality, information exchange, openness and communication as important ingredients in buyer-supplier partnership. Chopra *et al.,* (2010) claimed that buyer- supplier relationships were becoming more popular in supply chain because of their ability to reduce fraction and uncertainty. According to Zailani and Rajagopal (2005) long-run collaborative relationships with key supplier contribute to firm's financial performance.

According to Chopra *et al*. (2007) a supply contract specifies what governs the buyer-supplier relationship as it guides the behavior and performance of all the parties. In addition to volume or capacity, lead time, price and liabilities, penalties are part of the contracts. Contracts are structured to increase profitability, reduce risks by giving accurate information and enhancing flexibility. Dekker, Sakaguchi and Kawai (2013) also stated that well-specified contracts might actually promote more cooperative, long-term, trusting exchange relationships. Well-specified contracts narrow the domain and severity of risk to which an exchange is exposed, and thereby encourage cooperation and trust. Dekker *et al.* (2004) also argue that contracts and relationships are complementary. Using structured contractual mechanisms organizations can improve and coordinate better with suppliers and secure different supply options (Chopra *et al*., 2007).

Micheli *et al*. (2008) have said that suppliers are vital to the success of a firm, in terms of their reliability in availability and on the competitive edge of the final product, impact the level of risk. Supplier selection, diversification, supplier partnership and interaction, contract agreement, are some of the strategies used to manage supply chain risks. Hence the study hypothesized the relationship between supply base strategies and supply chain performance in food and beverage manufacturing firms.

Hypothesis: Supplier base rationalization risk strategies have positive influence on performance of food and beverage manufacturing firms.

2.2.4 Learning Theory

According to Deming (1986), the learning of individuals and organisations is a process or loop, which contains separate elements. Deming (1986) presents the following elements: observation emotional reaction-judgment- intervention. According to Koskinen (2012) supply chain management learning can be at the individual, team, node, and supply chain level when its individuals gain new knowledge, behaviour, skills, values, preferences, or understanding.

The ability to learn from past disruptions to develop better preparedness for future events is important to supply chain risk management (Ponomarov & Holcomb, 2009). Therefore, leading companies provide training to employees, suppliers and customers supply network risks to raise awareness and reinforce the importance of supply chain resilience (Blackhurst *et al*., 2011;Schoenherr, Tobias, Griffith, David, Chandra & Aruna, 2014). Besides learning (i.e. knowledge creation) from past experiences and establishing standard practices within the supply chain, knowledge and understanding of supply chain structures – both physical and informational – are important elements of supply chain risk management (Choi *et al.,* 2012). There are other useful and less formal ways in which practitioners share and transfer knowledge: through reflective practice, collaboration, networking, storytelling, coaching, mentoring, and quality circles (Sense, 2008; Samuel, Goury, Gunasekaran & Spalanzani, 2011).

Supply chain risk control is the process of taking proactive steps to reduce the identified risks where possible and putting procedures, rules or policies in place to minimize the residual risk or to reduce the severity of such a loss (Hepenstal & Boon, 2007; Son& Orchard, 2012). Effective supply chain risk management requires supporting infrastructure which is executive led (Flynn, Huo & Zao, 2010; Lockamy, 2014).It has been viewed that companies have been implementing different strategies and philosophies to control inventory, to eliminate waste, bring continuous improvement, to improve forecasting and improved efficiency and responsiveness(Christopher, Peck & Towill 2006; Kleindorfer & Saad, 2005).

The inventory management includes determination of the order quantity, the timing of order, reorder point and the replenishment of inventory. Inventory management and control are crucial to supply chain risk control strategies because mismanagement of inventory threatens a firm's viability (Sople, 2010; Juttner & Maklan, 2011).Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. Further, excessive inventory frequently compensates for sloppy and inefficient management, poor forecasting, haphazard

scheduling, and inadequate attention to process and procedures. Khan, Christopher and Burnes (2008) concluded that companies with very high inventory ratios have more possibilities to be bad financial performers. Strategic inventory reserves could be used to mitigate against supply chain risks (Vilko, Ritala, & Edelmann, 2014). The effect of supply chain risks is decreased by forecast accuracy, thus it might increase the cost of inventory or stock. In order to mitigate these risks, the firm can use pool or aggregate demand forecasting (Musa & Tang, 2012).

The responsiveness of a supply chain describes how quickly it responds to customer (Li *et al*., 2008 Christopher *et al*., 2006), and being able to reconfigure the supply chain (Bernardes & Hanna, 2009). Responsive supply chain ensures delivery in time, cost reduction and accurate forecasting of data (Mehrjerdi, 2009).One requisite for continuous improvement and responsiveness is employee training and a culture that embraces quality principles (Christopher & Lee, 2004). Techniques such as tactical cycle and operational cycle can detect if processes deviate from the planned. The main objectives for the tactical cycle are to identify, measure and prioritise (IMP) risks inherent in the organisation's supply chain processes. This is also referred to as risk chain analysis(RCA) because the aim is to identify those process risks inherent within the supply chain that are critical to the business and to prioritise them so that ultimately the organization can maximise the reduction in the supply chain process risk (Cranfield, 2011).

The main objectives for the operational cycle are to analyse, reduce and control (ARC) high priority risks through individual risk management projects (Cranfield, 2011). Even after a successful risk management activity, continuous monitoring is necessary to control the risk, analyze the effectiveness of the applied mitigation strategy and adjust measures if necessary at each step of the supply risk management process based on lessons learned (Craighead *et al*., 2007; Giunipero & Eltantawy, 2004; Matook *et al*., 2009; Rees and Allen, 2008).Performing companies provide training to employees, suppliers and customers on inventory management, forecasting, responsiveness and

continuous improvement to raise awareness and reinforce the importance of supply chain resilience. Drawing on learning theory, the study hypothesized that:

Hypothesis: Supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firms.

2.2.5 Avoidance strategies

Theory of Constraints

Theory of Constraints (TOC) is a management philosophy developed by Goldratt (1984) in his book, *The Goal.* It postulates that an organization is a system, and every system has at least one constraint limiting it from achieving its goal of making (more) money. In order to improve the performance of the system, these constraints must be identified (described) and corrective measures taken (a prescription). Identifying the constraints help to focus the limited resources to the weakest part for the system to improve. The three ways to the ultimate goal include: throughput (T), inventory (I) and operating expenses (OE). A system can, therefore, be evaluated and controlled by the three. Throughput is defined as the rate at which the system generates revenue through sales. Inventory is all the money that the system has invested in purchasing things which it intends to sell. Goldratt defined operational expense as all the money the system spends to change inventory into throughput.

A constraint is anything that prevents a system from achieving its goal. The theorist suggests two types of constraints: internal and external constraints. An internal constraint exists when a system cannot produce/deliver enough for the market while an external one exists when the system delivers/produces more than the market can take. Internal constraints could be physical or policy constraints. Physical constraints include equipment and people. Depending on the use, the equipment could be a constraint. For people, it could be lack of enough skilled personnel or basically their attitudes limiting

the achievement of the goal. Policy constraint is a written or unwritten practice that prevents the system from attaining the goal.

From Goldratt's three measurement dimensions, an organization has three different ways of improving the organizational output: increasing the throughput (T), reducing the inventory (I) or reducing the operating expense (OE). This research is concerned with supply chain risks as constraints that can be focused on to cause system improvement (Prater, 2005). The goals for SCM are to develop value-added processes that deliver innovative, high-quality, low-cost products on time with shorter development cycles and greater responsiveness (Fawcett, Ogden Magnan & Cooper, 2006). There are risks that complicate successful supply chain management in food and beverage manufacturing firms: uncertain demand, costs, lead times, production prices etc (Samir & Aman, 2010).

Risk avoidance is the most effective risk management strategy in that by avoiding an activity, any chance of loss is eliminated (Khan & Burnes, 2007; Tuncel & Alpan, 2010). Avoidance strategies are classified as Type 1 and Type 2 (Manuj & Mentzer, 2008). Type 1 avoidance strategy is used when the risks associated with operating in a given product or geographical market, or working with particular suppliers or customers, is considered unacceptable. Manuj and Mentzer (2008) suggested that avoidance takes the form of exiting through divestment of specialized assets, delay of entry into a market or market segment, or participating only in low uncertainty markets. This type of strategy is geared toward driving overall probabilities associated with risk events of a decision to zero by ensuring that the risk does not exist (Tang & Tomlin, 2008; Manuj & Mentzer, 2008). In avoiding risks, managers are aware of the supply-demand and/or operating trade-offs associated with the options and choose to avoid or drop some of these risks (Ghadge *et al.,* 2013).Avoidance strategy Type 2 takes the form of preempting adverse events (Manuj & Mentzer, 2008).

Manuj and Mentzer (2008) posit that in avoidance strategy Type 2, reducing the frequency and probability of a risk event is of concern. This usually arises when managers have no option but to venture into high uncertainty demand or supply markets.

For example avoidance strategy for quality issues consists of site audit and approval, and product audit and approval. According to Christopher and Holweg (2011) supply chains operating in all types of environments attempt to avoid risks within the constraints of acceptable returns such as revenue and profit targets. If a supply chain has an option to not enter environment but still meet targets, then it is more likely to adopt a Type 1 avoidance strategy. However, if a supply chain has no choice but to enter an environment to achieve its targets, then it is more likely to adopt a Type 2 avoidance strategy (Manuj & Mentzer, 2008). All types of supply chains adopt avoidance strategies to varying degrees, driven by the availability or non-availability of options.

Hypothesis: Supply chain risk avoidance strategies have positive influence on performance of food and beverage manufacturing firms.

2.2.6 Resource based view

The resource-based view (RBV) of the firm is a theory that has been explored in academic literature as a means of explaining competitive advantage and, in turn, superior performance among firms (Clulow, Barry & Gerstman, 2007; Jugdev & Mathur, 2013). A key principle of the RBV is the relationship between customer value, competitive advantage and superior performance (Barney, 2007). The firm can provide value to customers in many ways, such as via superior production systems, lower cost structures and emphasis on customer service (Barney, 2007).

The theory highlights the firm as a unique collection of resources, but it emphasises that not all of these resources possess the potential to provide the firm with a sustained competitive advantage. Early proponents of the RBV identified characteristics of "advantage-creating" resources such as, value, rareness, inimitability and non-substitutability, durability, appropriability, substitutability and competitive superiority (Barney, 2007). In an effort to refine RBV, (Teece, 2007) argued for 'dynamic capabilities' which they defined as the firm's processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even

create market change. Dynamic capabilities are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge evolve (Hinterhuber, 2013).

According to Clulow *et al*. (2007) key resources have been identified as intangible assets (such as client trust and relationships) and capabilities (such as skills and knowledge). The competitive advantage gained by these key intangible assets and capabilities is then reflected in operational capabilities and performance improvements with superior performance usually measured in financial terms such as higher profits, increased sales or market share (Clulow *et al*., 2007; Hinterhuber, 2013; Jugdev & Mathur, 2013). The firm's view of advantage-creating resources has been extensively explored in empirical research in the past in the context of the wine industry (Oliveira de Wilk & Fensterseifer, 2003).

The main topic of that research concerned "The identification of the strategic resources and capabilities of a cluster of winery firms in Brazil". Kihyun (2011) showed using RBV how firms' resources and routines not only reduce the detrimental effect of supply chain disruptions but also formulate external-facing capabilities that lead to a competitive advantage. Through RBV the study views important connections that link internal resources and bundles of routines with external-facing capabilities-links that enable firms not only to respond to and recover from any supply chain risks but also to maintain or gain a sustainable advantage though superior supply chain performance.

Supply chain performance measurements

Supply chain performance measurement is the process of qualifying the efficiency and effectiveness of the supply chain (Wong & Wong, 2008). Supply chain performance measurement includes multiple dimensions including financial and non-financial metrics describing costs, capacity, lead times and service levels (Bigliardi & Bottani, 2014). SCM could be measured at various management or operation levels. Strategic level measures influence top management decisions and also very often reflects investigation

of broad based policies and level of adherence to organisational goals (Chopra *et al*., 2007). The tactical level deals with resource allocation and measuring performance against targets to be met in order to achieve results specified at the strategic level. At the operational level, metrics are relevant for day to day business. The main metrics of a firm's operation performance are based (1) cost; (2) quality; (3) flexibility; and (4) delivery. Recent studies on supply chain management have suggested that these priorities can be categorised into two fundamental dimensions: efficiency and responsiveness (Chopra *et al*., 2007).

The term efficiency refers to the ability of a supply chain to compete on costs. It is usually best suited to serve markets with predictable demands and for which the products have a long life cycle. The term responsiveness refers to the ability of a supply chain to respond quickly to market movements. In designing a responsive supply chain, the emphasis will be on quick and fast deliveries (Chopra *et al.,* 2007). Based on the operational priorities, this study adopted three metrics: cost, quality, delivery and customer service levels as proposed by researchers (Wong & Wong, 2008; Sherperd & Gunter, 2006; Bigliardi & Bottani, 2014).

2.3 Conceptual Framework

A conceptual framework is a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Kombo & Dello, 2006). The framework helps a researcher to organise his/her investigations by showing the connection variables. According to Johnson and Christensen (2010), a conceptual framework should analyse whether the objectives of the study have been addressed. In this study, influence of supply chain risk management on supply chain performance of FB manufacturing firms in Kenya, the independent variables to be studied are: supply chain flexibility, supply chain collaboration, supply chain base, avoidance and control. The study conceptualised a framework derived from reviewed literature as shown in Figure 2.1

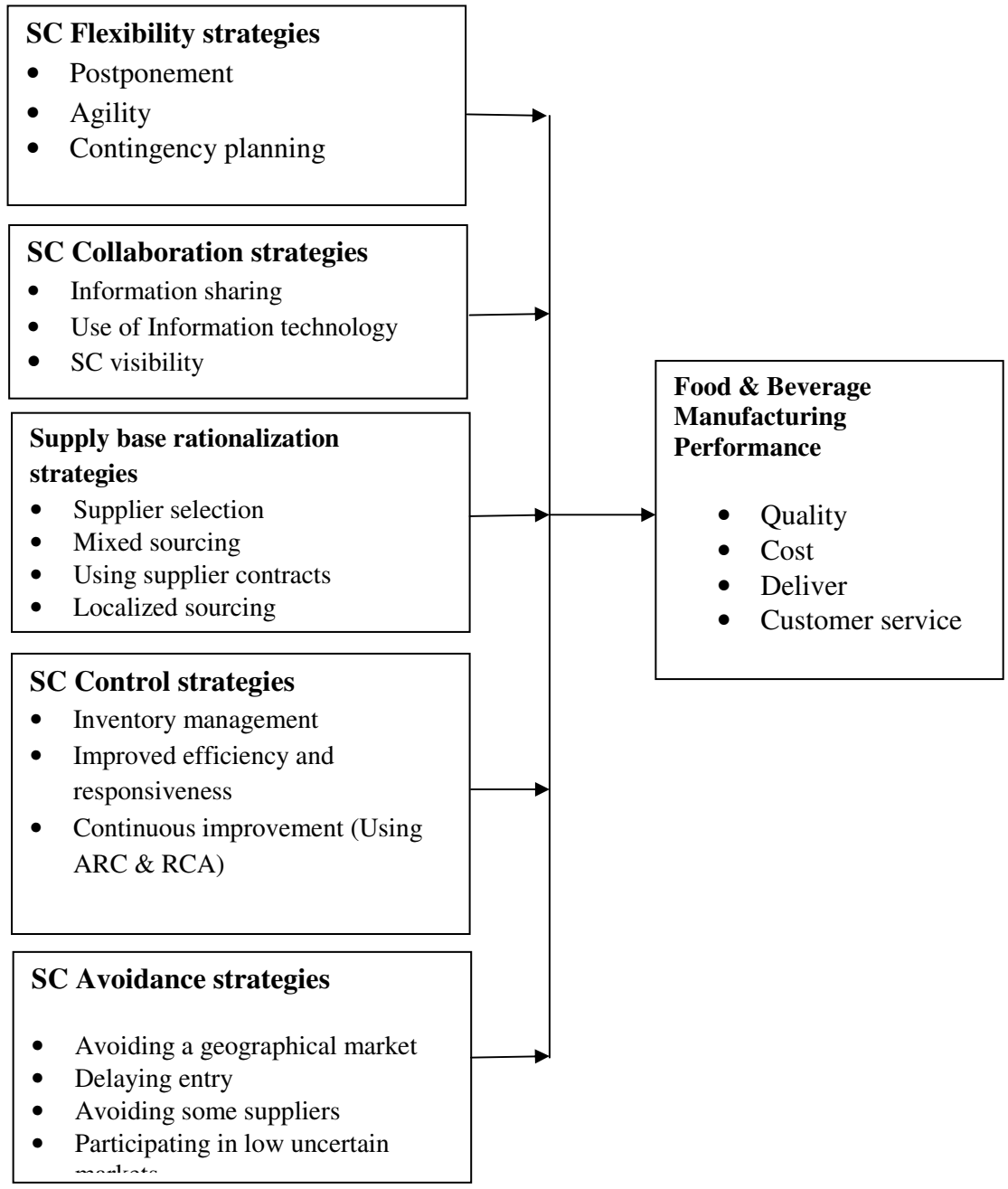

Figure 2.1: Conceptual Framework

2.4 Operationalisation of Variables

Based on several studies, supply chain risk management strategies are practices, tools or set of activities undertaken in a firm to promote effective management of its supply chain risk to ensure risk mitigation and a quick return to normal operation. Several researchers have explained how to deal with supply chain risks and make the supply chain process more secure and resilient (Christopher, 2005; Sheffi, 2006; Tang 2006).

Supply chain risk management in food and beverage processing industry impacts positively on the performance and eventual survival of the enterprises (Samir & Aman, 2010). Supply chain is a source of competitive advantage to various industries (Chopra *et al*. 2007; Chen & Kang, 2007), especially by saving on costs, growing sales and sustaining high customer service. To attain this competitive advantage, businesses must devise appropriate supply chain management strategies that are aligned to the business strategy (Chopra *et al*., 2007). .

2.4.1 Supply Chain Flexibility Strategies

This strategy allows food and beverage manufacturers to react to unforeseen events such as short delivery delays, uncertain demands as well as natural disasters. According to Liu *et al*. (2010) firms that achieve higher levels of flexibility and agility significantly outperform their less flexible counterparts. Flexible firms are more innovative, dynamic and responsive to changes and challenges (Gligor & Holcomb, 2012; Tang & Tomlin, 2009). Flexibility positively impacts its ability to enhance comparative performance relative to leading industry competitors. Nembhard *et al*. (2005) noted that a manufacturing firm can have the flexibility to select different suppliers, plant locations, and market regions.

Flexibility is significant for supply chains that face demand and supply risks since flexibility helps a firm reallocate resources quickly and smoothly in response to change. In volatile and uncertain environments, dynamic capabilities such as flexibility can be

harnessed to achieve growth. Dynamic capabilities are defined as the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market oriented decisions, and to change its resource base (Barreto, 2010).

Agility

Agility is mostly understood as the ability of a supply chain to rapidly respond to change by adapting its initial stable configuration (Christopher, Peck, Towill, 2006; Bernades & Hanna, 2009). Agile paradigm favours high availability and responsiveness to changes in product mix and volume (Christopher *et al.,* 2006; Urciuoli, 2010) being fast (Liu, Lin & Hayes, 2010). According to Bernades *et al*. (2009) agility comprises of all kind of changes. Nag, Han and Yao (2013) viewed agility as comprising of two main factors: responding to changes in proper ways and due time, and exploiting changes and taking advantage of changes as opportunities to survive and prosper in a competitive environment. Liu *et al*. (2010) regarded the main capabilities of an agile production system as the ease with which the system can change between products, and the ability to introduce new products without investments.

Postponement

Postponement is the ability to delay the actual commitment of resources and activities to maintain flexibility and delay incurring costs (Li, Lin, Wang & Yan, 2006). According to Choi, Narasimhan and Kim (2012), there are three categorizes of postponement: time postponement, form postponement, and place postponement. Time postponement refers to the movement of goods from manufacturing plants only after customer orders are received (Bessant, 2008). Form postponement refers to determining the form and function of products. Form postponement includes labeling, packaging, assembly, and manufacturing. The extent of form postponement depends on demand customization, component costs, product life cycle, and product modularity (Choi & Krause, 2006).

Place postponement refers to positioning upstream inventories in the manufacturing process. Tang (2006) has argued that postponement is a robust demand management strategy that leads to supply chain efficiency and supply resilience. The strategy enables food and beverage manufacturers to better manage risks by delaying resources and activities. Postponement is an effective strategy in enhancing supply chain efficiency when facing uncertain demands for diverse products.

Contingency Planning

According to Skipper and Hanna (2009), contingency planning is a special type of planning that provides firms with a blueprint for managing risk related to unknown occurrence. Contingency planning is significant to achieving flexibility (Ponomarov, 2012). Contingency planning includes increasing production at alternative locations, temporarily switching transportation, and shifting customer demand to alternative products (Tang & Tomlin, 2009).The contingency plan must be specific in terms of time and complete response to risks. The process of planning include risk assessment, risk evaluation and management, relationship management, first response, security, operations, stability, subsequent stages of response, and performance evaluation (Skipper & Hanna, 2009). Sheffi (2006) has suggested that contingency planning should describe and define the roles, procedures, duties, and responsibilities of key players in a firm to significantly reduce unexpected disruptions.

2.4.2 Supply Chain Collaboration Strategies

Supply chain relations are based on integration, coordination and collaboration across the supply chain from the customers to the suppliers (Swink, 2006). According to Chopra *et al*. (2007), collaboration is the agreement between or among supply chain actors to integrate their resources for mutual benefits. According to Musa, Wei and Tang (2012), firms need to develop routines and practices that lead to collaboration among partners. The main pillars of a collaborative relationship are trust, transparency and faith (Chopra *et al*., 2007).

According to Sodhi and Tang (2012), a supply chain is fully coordinated when all decisions are aligned to accomplish common objectives. Lack of coordination will result in distortion of demand, (bullwhip effect) increase manufacturing cost, inventory cost, replenishment lead time, transportation cost, labour cost, decrease in efficiency, profit, information distortion (Paik & Bagchi, 2007).The collaborative supply chain has therefore become crucial in reducing supply chain risks (Tang, 2006). Arshinder and Deshmukh (2007) argued that sharing of information between supply chain members helps to substitute information with inventory and lead time, reduces the supply chain costs, reduces the demand variability, enhances responsiveness and improves the service level. There is a positive relationship between collaboration and performance (Breuer, Siestrup, Haasis & Wildebrand, 2013). Collaboration with suppliers and customers when responding to risk as well as redesigning products and processes gives firms an advantage through increased information flow, reduced uncertainty, improved quality and increased profitability (Sheffi & Rice, 2005; Richie & Brindley, 2007).

Information Sharing

Mitchell and Nault (2007) have argued that synchronized business processes such as material, information and financial flows improve supply chain performance thus leading to business growth. Collaborative SC relies on the desire to share information and collaborative management. Effective information sharing among partners is a key determinant in reducing internal and external risk in the supply chain environment (Christopher, Mena, Khan & Yurt, 2012; Tang, 2006) Inter-organisational informational system (IOS)-a SC informational infrastructure- can disseminate real time demand and supply information throughout the supply chain thus reducing risks. Some of the infrastructure necessary include, message-based systems that transmit information to partner technologies such as fax, e-mail, electronic data interchange (EDI) or extensible markup language (XML). Electronic procurement hubs, portals or marketplaces that facilitate purchasing of goods or services electronically promote partnerships (Tang and Zimmerman, 2013). Also important is the collaborative planning, forecasting and

replenishment (CPFR) systems, vendor-managed inventory (VMI), efficient consumer response (ECR) and quick response.

Supply chain visibility

Visibility within the supply chain refers to knowing where inventory is at any moment from the producer to the final destination (Christopher *et al.,* 2012). Supply chain visibility is also actionable information that can help support customers and be applied to myriad points along the supply chain—from supplier to service provider to end customer—to remove redundancies and improve processes to give a firm a competitive advantage (Musa *et al*., 2012). Supply chain visibility can be improved through the use of information technology (IT).

Using IT data solutions, trading partners and customers can securely see what's happening across the entire supply chain. According to Li, Lin, Wang and Yan (2006) supply chain visibility has the following advantages: it shows you real-time order, inventory and shipment information, systemically monitors perishables and reduces inventory loss from expired goods, reduces costs associated with expedited delivery, lower inventory levels and safety stocks, improves customer service, while raising productivity of customer service representatives and achieves faster time-to-market for new product (Musa *et al*., 2012).

2.4.3 Supply Base Rationalization Strategies

Supply management is widely acknowledged as strategic for companies, because they contribute to build and to maintain a competitive advantage (Hsu, Kannan, Leong & Tan, 2006; Chopra *et al*., 2007). Supply management has become more critical because there is an increasing dependence on suppliers. The dependence makes companies highly exposed to supply risks. According to Tang (2006) supply management should have a positive impact on the mitigation of the supply chain risks. Many researchers have posited several supply base strategies that can be used to reduce supply chain risks.

These include an extended usage of flexible contract agreements, inspections to qualify suppliers and may be even combined with make and buy strategies to split production across different factories (Sheffi, 2006), selecting dual rather than single sourcing (Wieland, 2013), building trust in relationships (Srinivasan, Mukherjee & Gaur, 2011), managing risk in a proactive manner and finding a balance and alignment between benefits gained from and costs of risk management (Paik & Bagchi, 2007), risk sharing through sourcing relationships (Hsu *et al.,* 2006) by establishing a close relationship with single source suppliers and instituting less close relationships with a number of different suppliers in order to spread risks (Sheffi & Rice, 2005), and determining a number of technological methods to discover, recover and redesign the supply chain (Blackhurst *et al*., 2011).

Supplier diversification

It has been recognized that the diversification of suppliers is a strategy to handle disruptions. The access to a wider supply base enables firms to inject in supply chains additional production lines and quickly shift volumes and production in case of a disruption (Sheffi, 2006; Tang, 2006; Tomlin, 2006; Tørhaug, 2008). By diversifying the portfolio of suppliers, risk is spread across multiple players, therefore decreasing the impact any single player can have on the supply stream (Manuj & Mentzer, 2008b). Adding another supplier decreases the expected return, but in turn lowers the risk variance and deviation from the mean (Musa & Tang, 2012).

Supplier selection

Supplier selection strategy becomes one of the most important practices in supply chain risk mitigation (Hsu *et al*., 2006) Supplier selection is done after the firm has decided on either single sourcing or multiple sourcing. Supplier selection should be based not only on the price of the acquisition, but also on a wide range of criteria such as quality, organizational parameters and capabilities with a view to reducing supply chain risk (Micheli, Cagno & Zorzini, 2008). Supplier selection based on quality, pricing, delivery

and performance of product have significant relationship with four elements of customer satisfaction -product quality, product variety, delivery service and competitive pricing- and firm performance (Ponomarov, 2012).

Buyer-supplier Partnerships

Building collaborative supply base with supplier is the key element in supplier strategy. Chopra *et al.* (2007) referred to trust, mutuality, information exchange, openness and communication as important ingredients in buyer-supplier partnership. Chopra *et al.,* (2010) claimed that buyer- supplier relationships were becoming more popular in supply chain because of their ability to reduce fraction and uncertainty. According to Zailani and Rajagopal (2005) long-run collaborative relationships with key supplier contribute to firm's financial performance.

Using supply contracts

According to Chopra *et al*. (2007) a supply contract specifies what governs the buyer-supplier relationship as it guides the behavior and performance of all the parties. In addition to volume or capacity, lead time, price and liabilities, penalties are part of the contracts. Contracts are structured to increase profitability, reduce risks by giving accurate information and enhancing flexibility. Dekker, Sakaguchi and Kawai (2013) also stated that well-specified contracts might actually promote more cooperative, long-term, trusting exchange relationships. Well-specified contracts narrow the domain and severity of risk to which an exchange is exposed, and thereby encourage cooperation and trust. Dekker *et al.* (2004) also argue that contracts and relationships are complementary. Using structured contractual mechanisms organizations can improve and coordinate better with suppliers and secure different supply options (Chopra *et al*., 2007).

Micheli *et al*. (2008) have said that suppliers are vital to the success of a firm, in terms of their reliability in availability and on the competitive edge of the final product, impact

the level of risk. Supplier selection, diversification, supplier partnership and interaction, contract agreement, are some of the strategies used to manage supply chain risks.

2.4.4 Supply Chain Control Strategies

The ability to learn from past disruptions to develop better preparedness for future events is important to supply chain risk management (Ponomarov & Holcomb, 2009). Therefore, leading companies provide training to employees, suppliers and customers supply network risks to raise awareness and reinforce the importance of supply chain resilience (Blackhurst *et al*., 2011; Schoenherr, Tobias, Griffith, David, Chandra & Aruna, 2014).

Besides learning (i.e. knowledge creation) from past experiences and establishing standard practices within the supply chain, knowledge and understanding of supply chain structures – both physical and informational – are important elements of supply chain risk management (Choi *et al.,* 2012). There are other useful and less formal ways in which practitioners share and transfer knowledge: through reflective practice, collaboration, networking, storytelling, coaching, mentoring, and quality circles (Sense, 2008; Samuel, Goury, Gunasekaran & Spalanzani, 2011).

Supply chain risk control is the process of taking proactive steps to reduce the identified risks where possible and putting procedures, rules or policies in place to minimize the residual risk or to reduce the severity of such a loss (Hepenstal & Boon, 2007; Son & Orchard, 2012). Effective supply chain risk management requires supporting infrastructure which is executive led (Flynn, Huo & Zao, 2010; Lockamy, 2014).It has been viewed that companies have been implementing different strategies and philosophies to control inventory, to eliminate waste, bring continuous improvement, to improve forecasting and improved efficiency and responsiveness (Christopher, Peck & Towill 2006; Kleindorfer & Saad, 2005).

Inventory management

The inventory management includes determination of the order quantity, the timing of order, reorder point and the replenishment of inventory. Inventory management and control are crucial to supply chain risk control strategies because mismanagement of inventory threatens a firm's viability (Sople, 2010; Juttner & Maklan, 2011).Too much inventory consumes physical space, creates a financial burden, and increases the possibility of damage, spoilage and loss. Further, excessive inventory frequently compensates for sloppy and inefficient management, poor forecasting, haphazard scheduling, and inadequate attention to process and procedures.

Khan, Christopher and Burnes (2008) concluded that companies with very high inventory ratios have more possibilities to be bad financial performers. Strategic inventory reserves could be used to mitigate against supply chain risks (Vilko, Ritala, & Edelmann, 2014). The effect of supply chain risks is decreased by forecast accuracy, thus it might increase the cost of inventory or stock. In order to mitigate these risks, the firm can use pool or aggregate demand forecasting (Musa & Tang, 2012).

Improved efficiency and responsiveness

The responsiveness of a supply chain describes how quickly it responds to customer (Li *et al*., 2008; Christopher *et al*., 2006), and being able to reconfigure the supply chain (Bernardes & Hanna, 2009). Responsive supply chain ensures delivery in time, cost reduction and accurate forecasting of data (Mehrjerdi, 2009). One requisite for continuous improvement and responsiveness is employee training and a culture that embraces quality principles (Christopher & Lee, 2004). Techniques such as tactical cycle and operational cycle can detect if processes deviate from the planned. The main objectives for the tactical cycle are to identify, measure and prioritise (IMP) risks inherent in the organisation's supply chain processes. This is also referred to as risk chain analysis (RCA) because the aim is to identify those process risks inherent within the supply chain that are critical to the business and to prioritise them so that ultimately

the organization can maximise the reduction in the supply chain process risk (Cranfield, 2011).

Continuous improvement

The main objectives for the operational cycle are to analyse, reduce and control (ARC) high priority risks through individual risk management projects (Cranfield, 2011). Even after a successful risk management activity, continuous monitoring is necessary to control the risk, analyze the effectiveness of the applied mitigation strategy and adjust measures if necessary at each step of the supply risk management process based on lessons learned (Craighead *et al*., 2007; Giunipero & Eltantawy, 2004; Matook *et al*., 2009; Rees & Allen, 2008). Performing companies provide training to employees, suppliers and customers on inventory management, forecasting, responsiveness and continuous improvement to raise awareness and reinforce the importance of supply chain resilience.

2.4.5 Supply Chain Avoidance Strategies

Risk avoidance is the most effective risk management strategy in that by avoiding an activity, any chance of loss is eliminated (Khan & Burnes, 2007; Tuncel & Alpan, 2010). Avoidance strategies are classified as Type 1 and Type 2 (Manuj & Mentzer, 2008). Type 1 avoidance strategy is used when the risks associated with operating in a given product or geographical market, or working with particular suppliers or customers, is considered unacceptable. Manuj and Mentzer (2008) suggested that avoidance takes the form of exiting through divestment of specialized assets, delay of entry into a market or market segment, or participating only in low uncertainty markets. This type of strategy is geared toward driving overall probabilities associated with risk events of a decision to zero by ensuring that the risk does not exist (Tang & Tomlin, 2008; Manuj & Mentzer, 2008). In avoiding risks, managers are aware of the supply-demand and/or operating trade-offs associated with the options and choose to avoid or drop some of

these risks (Ghadge *et al.,* 2013). Avoidance strategy Type 2 takes the form of preempting adverse events (Manuj & Mentzer, 2008).

Manuj and Mentzer (2008) posit that in avoidance strategy Type 2, reducing the frequency and probability of a risk event is of concern. This usually arises when managers have no option but to venture into high uncertainty demand or supply markets. For example avoidance strategy for quality issues consists of site audit and approval, and product audit and approval.

According to Christopher and Holweg (2011) supply chains operating in all types of environments attempt to avoid risks within the constraints of acceptable returns such as revenue and profit targets. If a supply chain has an option to not enter environment but still meet targets, then it is more likely to adopt a Type 1 avoidance strategy. However, if a supply chain has no choice but to enter an environment to achieve its targets, then it is more likely to adopt a Type 2 avoidance strategy (Manuj & Mentzer, 2008). All types of supply chains adopt avoidance strategies to varying degrees, driven by the availability or non-availability of options.

2.4.6 Supply Chain Performance Measurements

Supply chain performance measurement is the process of qualifying the efficiency and effectiveness of the supply chain (Wong & Wong, 2008). Supply chain performance measurement includes multiple dimensions including financial and non-financial metrics describing costs, capacity, lead times and service levels (Bigliardi & Bottani, 2014). SCM could be measured at various management or operation levels. Strategic level measures influence top management decisions and also very often reflects investigation of broad based policies and level of adherence to organisational goals (Chopra *et al*., 2007). The tactical level deals with resource allocation and measuring performance against targets to be met in order to achieve results specified at the strategic level. At the operational level, metrics are relevant for day to day business. The main metrics of a firm's operation performance are based (1) cost; (2) quality; (3) flexibility; and (4)

delivery. Recent studies on supply chain management have suggested that these priorities can be categorised into two fundamental dimensions: efficiency and responsiveness (Chopra *et al*., 2007).

The term efficiency refers to the ability of a supply chain to compete on costs. It is usually best suited to serve markets with predictable demands and for which the products have a long life cycle. The term responsiveness refers to the ability of a supply chain to respond quickly to market movements. In designing a responsive supply chain, the emphasis will be on quick and fast deliveries (Chopra *et al.,* 2007). Based on the operational priorities, this study adopted three metrics: cost, quality, delivery and customer service levels as proposed by researchers (Wong & Wong, 2008; Sherperd & Gunter, 2006; Bigliardi & Bottani, 2014).

2.5 Empirical Review

Supply chain risk management (SCRM) is one of the most critical areas in the management of manufacturing especially food and beverage firms (WHO, 2014). Although several studies have been conducted on SCRM (APPENDIX 2), little has been done on the influence of SCRM on supply chain performance of food and beverage manufacturing in Kenya. A literature review reveals studies conducted in Europe and North America. These studies include:

2.5.1 SC Flexibility strategies

Kihyun (2011) provided a theoretical framework for resilient supply chain framework and empirical validation of supply chain risk as well as processes used to manage supply chain risks effectively. Drawing upon contingency theory and resource-based perspective, the study identifies coordination mechanisms within supply chain practices, including risk perceptions, assessment, management, and outcomes. Kihyun (2011) clarified and defined what it means to develop and maintain supply chain resilience and the type of firm-level practices that characterize supply chain processes as more secure

and resilient. The study examined the following factors: antecedents that lead a focal firm to adopt and implement resilient supply chain practices that, in turn, enable supply chain processes to be more resilient; flexible resilient supply chain practices (contingency planning, information sharing, collaboration, postponement, and security compliance) and redundant resilient supply chain practices (safety stock and slack capacity); and resilient supply chain capabilities that exhibit readiness, response, and recovery capabilities. The large-scale survey data was collected from the U.S. and South Korea, and analyzed by Structural Equation Modeling using AMOS 6.0. Out of eight hypotheses, five were supported to show interrelationship among resilient supply chain antecedents, practices, and capabilities using data from respondents.

Wieland and Wallenburg (2012) empirically tested hypotheses on the influence of supply chain risk management (SCRM) on the performance of a supply chain by means of case study. Survey data were collected from 270 manufacturing companies for hypotheses testing via structural equation modeling. Additionally, qualitative data were collected to explore the nature of non-hypothesized findings. The study found out that robustness can be considered a basic prerequisite to deal with supplier-side risks, while agility is necessary to deal with customer-side risks. Being agile has a strong positive effect on the supply chain's customer value, while its impact on business performance is mediated by the supply chain's customer value and, thus, is indirect only. In contrast, achieving robustness has a strong positive direct effect on both the supply chain's customer value and business performance. Therefore, the implementation of SCRM, which entails the identification, assessment, and controlling of risks, allows companies to better cope with changes both proactively and reactively. According to Wieland & Wallenburg (2012)other possible facilitators of agility and robustness are cooperation, insurance, and postponement.

2.5.2 SC Collaboration Strategies

Wieland and Wallenburg (2012) explored empirically the resilience of supply chain. The study investigated the effects relational competencies have for resilience and the effect

resilience, in turn, has on a supply chain's customer value. Wieland and Wallenburg (2012) employed a confirmatory approach that builds on the relational view as a primary theoretical foundation. It utilizes survey data collected from manufacturing firms from three countries, which is analyzed using structural equation modeling. The researchers found that communicative and cooperative relationships have a positive effect on resilience, while integration does not have a significant effect. It is also found that improved resilience, obtained by investing in agility and robustness, enhances a supply chain's customer value.

Vaaland and Heide (2007) focused their study on small and medium sized enterprises (SMEs) and the extent to which they were prepared to meet SCM challenges through the use of modern planning and control methods. Using a cross-sectional survey of 200 Norwegian companies with informants mainly related to the SCM function and from top management, the findings indicate that the SMEs and the LEs generally agree on which of the various planning and control methods that are most relevant for developing and maintaining competitive supply chains. The important issue is that size matters when assessing the importance of the methods for planning and control. Planning and control methods include collection, processing and distribution of information, both within the focal company and across company boundaries. The methods are either functional, for example in keeping track of transportation operations, or cross functional, for example when handling the order process, inventories, sourcing and invoicing. Planning and control methods are crucial for enhancing SCM competitiveness through reduction of transaction costs considerably and freeing up the level of locked up capital. Even more importantly, modern management methods open up for new business opportunities and radical improvements in the supply chain.

Christopher and Lee (2004) suggested that one key element in any strategy designed to mitigate supply chain risk is improved "end-to-end" visibility. The study argued that supply chain "confidence" will increase in proportion to the quality of supply chain information. To restore supply chain confidence and break the risk spiral, organizations

must address the two basic elements of supply chain confidence: visibility and control. Total end-to-end visibility will enable supply chains to be transparent, and the right information would be available to the right member of the supply chain at the right time. Enabling adequate control levers to be accessible to the partners will also allow prompt actions to be taken when information reveals such needs. Although in some cases one may take priority over the other, both visibility and control are necessary. Christopher and Lee (2004) gave several examples of organizations that have either suffered or survived because of visibility and control. For example, Benetton's extensive EDI network linking its design centre with the network of outsourced manufacturers, sales agents, retail outlets, transportation carriers and logistics centres allow the supply chain to become transparent.

2.5.3 Supply Base Rationalization Strategies

Ellegaard (2008) addressed the supply risk management practices of small company owners. First, the researchers reviewed SCM literature to identify types of supply risk and identify the most prevalent methods of supply risk management. The findings confirm that the 11 studied small businesses apply largely the same supply risk management practices. The strategies cover risk elimination practices such as knowledge protection and local sourcing as the major practices, combined with relational practices such as fairness, loyalty, and seeking out responsive, dependable, and responsive and dependable suppliers. An interpretive case based methodology was applied in this research. Interview data on the supply risk management practices of 11 small company owners were analysed.

Christopher and Peck (2005) empirically based and drew on insights from a number of important industries including food retailing, oil and petrochemicals, pharmaceutical, packaging, electronics, transport services and the distribution of automotive spares. It also included input from private and public sector organisations involved in the provision of health care and in defense. In particular it focused on the development of a managerial agenda for the identification and management of supply chain risk, with

recommendations to improve the resilience of supply chains. The study, based upon a framework originally proposed by Mason-Jones and Towill, suggested three categories of risk which can be further sub-divided to produce a total of five categories: risks internal to the firm (process and control); risks external to the firm but internal to the supply chain network (demand and supply); risks external to the supply chain network (environmental). The study also proposed several supply chain risk management strategies such as supply chain re-engineering, supply chain collaboration, agility and developing culture of risk management through learning.

Among the re-engineering practices is a review of the supply base. The researchers argue that where a firm has multiple sites it may be possible to have a single source for an item or service into each site thus gaining some of the advantages of single sourcing without the downside risk. Similarly if a manufacturing firm makes a range of products it may be possible to single source by product thus keeping an alternative source of supply available. The study further advocates for the adoption of pro-active strategy of supplier development to improve a firms supply chain risk management practices. For example, supplier selection based on the risk awareness of supplier- suppliers should be aware of their own risks.

2.5.4 SC Control Strategies

Cantor, Blackhurst, Pan and Crum (2014) build upon other studies by examining how firms respond to stakeholder pressure by enhancing its knowledge management (KM) capabilities across the supply chain. The analysis was carried out using structural equation modeling techniques. The sample for the survey consisted of 4456 supply chain management professionals who are employed in US manufacturing industries. The results demonstrate that stakeholders place pressure on the firm to mitigate risk andthat an important organizational strategy that firms can pursue to minimize supply chain risk is to mobilize its KM resources to facilitate improved collaboration with the firm's supply base. In so doing, the firm can become more responsive to changes in customer demand.

Son and Orchard (2012) examined supply-side disruptions in a supply chain, and analysed the effectiveness of two inventory-based policies for mitigating the impact of supply disruptions: maintaining strategic inventory reserves (the R-policy), and using larger orders (the Q-policy). The two inventory-based mitigating policies were assessed when implemented at a reseller when end customer demand is stable but supply can be disrupted. An analytical model was provided, and numerical experiments were conducted to evaluate the effectiveness of the policies for mitigating the impact of disruption under different disruption scenarios. The results of the study indicated show that the use of strategic inventory reserves proves to be a more effective tool for mitigating supply disruption impact than the practice of maintaining larger stocks of cycle inventory via larger orders, particularly in terms of reducing the probability of incurring a stock out during a supply disruption. The study therefore recommends that the use of strategic inventory reserves that are separate from traditional safety stock would apply in cases where the reserves would be inventoried at lower holding costs and where the reserves would come with a fixed cost; otherwise, it would be impractical not to access reserves to prevent stock outs during "normal" times.

2.5.5 SC Avoidance Strategies

Manuj and Mentzer (2008) explored the phenomenon of risk management and risk management strategies in global supply chains. This study was based on an extensive literature review and a qualitative study comprising 14 in-depth interviews and a focus group meeting with senior supply chain executives. The study provides insights into the applicability of six risk management strategies with respect to environmental conditions and the role of three moderators. The supply chain risk management strategies include postponement, speculation, hedging, control/share/transfer, security, andavoidance. According to Manuj and Mentzer (2008) Postponement entails delaying the actual commitment of resources to maintain flexibility and delay incurring costs. Speculation, on the other hand, includes such actions as forward placement of inventory in country markets, forward buying of finished goods or raw material inventory, and early

commitment to the form of a product, all in anticipation of future demand. Avoidance strategy is used when the risks associated with operating in a given product or geographical market, or working with particular suppliers or customers, is considered unacceptable. The study found out that avoidance takes the form of exiting through divestment of specialized assets, delay of entry into a market or market segment, or participating only in low uncertainty markets. Avoidance may also take the form of preempting adverse events.

2.6 Critique of Empirical Literature

Hendricks and Singhal (2005) empirically investigated the association between supply chain glitches (e.g. parts shortages) and various performance indicators. They found that firms who experience glitches report on average lower sales growth, higher increases in cost, and higher increases in inventories. This indicates that a proactive management strategy (i.e. robustness) is necessary in order to prevent supply chain glitches from occurring, which, in turn, helps to prevent deteriorating business performance. Hendricks and Singhal (2005) reported that supply chain disruptions can lead to a company's long-term negative financial performance, especially in terms of shareholder wealth and stock returns when compared to an industry benchmark. However, Hendricks and Singhal sample was biased towards electronic business the results may therefore not reflect the situation in the food and beverage industry.

In their empirical work, Wagner and Bode (2008) found out that both supply and demand-side risks have a significant negative impact on supply chain performance, which they measure in terms of order fill capacity, delivery dependability, customer satisfaction and delivery speed. The objective of this research was to provide a detailed operationalization of the supply chain risk construct; and to examine the relevance of various supply chain risk sources for strategic decision-making based on the relationship between supply chain risks and supply chain performance. Data were collected through a cross-sectional survey administered in Germany to a sample of 4,946 top-level executives in logistics and supply chain management. Data were gathered solely within

Germany. This limits the potential generalization of the study results to all types of businesses and economies.

Based on a sample of 760 top-level executives in logistics and supply chain management, the results of this study showed the negative relationship between supply chain risks and supply chain performance the study also advocated for better utilization of risk management resources to mitigate demand and supply chain risks. However, the data for the study were collected from firms based in Germany. Therefore, the results may hold only true for firms based in countries with a similar political, economic, and geographic setting. For example Kenya does not have similar political, economic, regulatory, legal and bureaucratic environment (World Bank, 2014).

Wieland and Wallenburg (2012) empirically tested hypotheses on the influence of supply chain risk management (SCRM) on the performance of a supply chain by means of case study. Survey data were collected from 270 manufacturing companies for hypotheses testing via structural equation modelling. Additionally, qualitative data were collected to explore the nature of non-hypothesized findings. It is found that SCRM is important for agility and robustness of a company. Both agility and robustness were shown to be important in improving performance. While agility has a strong positive effect only on the supply chain's customer value, but not directly on business performance, robustness has a strong positive effect on both performance dimensions. The case studies provide insights to the fact that robustness can be considered a basic prerequisite to deal with supplier-side risks, while agility is necessary to deal with customer-side risks. The amount of agility and robustness needs to fit to the competitive strategy of the firm.

Norrman and Jansson (2004) using a case study explored how Ericsson, after a fire at a sub-supplier, with a huge impact on Ericsson, implemented a new organization, and new processes and tools for supply chain risk management (SCRM). The study described attempts to analyze, access and manage risk sources along the supply chain, partly by working close with suppliers and by placing formal requirements on them. This

explorative study also indicated that insurance companies are source of improved SCRM, as they start to understand the vulnerability of modern supply chains. Their case study also provided a discussion of risk related to traditional logistics concepts by arguing that supply chain risks should also be put into the trade-off analysis when evaluating new logistics solutions – not with the purpose to minimize risks but to find the efficient level of risk and prevention. The lack of multiple informants from several firms offers the opportunity for further research. It would be informative to survey multiple sources and informants within the participating companies.

Ritchie and Brindley (2007) undertook a study to examine the constructs underpinning risk management and explored its application in the supply chain context through the development of a framework. The constructs of performance and risk were matched together to provide new perspectives for researchers and practitioners. The conceptual and empirical work in the supply chain management field and other related fields was employed to develop a conceptual framework of supply chain risk management (SCRM). Risk in the supply chain was explored in terms of risk/performance sources, drivers, consequences and management responses. Two empirical cases were used to illustrate the application of the framework. Brindrley and Ritchie (2007) presented a new framework that helps to integrate the dimensions of risk and performance in supply chains and provide a categorisation of risk drivers. The key finding was that performance and risk are interconnected and require deliberate and robust implementation of supplier management tools and controls to maximize performance whilst controlling the consequential risks. This research is inadequate in evaluation and dissemination of the supply chain risk management responses and practices being employed in different sectors.

Amongst recent empirical research on SCRM and supply disruptions is a study by Kern *et al*., (2012) which focused on the process dimensions of upstream SCRM and showed that competent SCRM which includes risk identification, assessment, and mitigation in companies leads to superior performance. Kern *et al.,* (2012) developed a model for

upstream supply chain risk management linking risk identification, risk assessment and risk mitigation to risk performance and validated the model empirically. The effect of a continuous improvement process on identification, assessment, and mitigation was also included in the model. A literature review was undertaken to derive the hypotheses and operationalize the included constructs. The study then tested the path analytical model using partial least squares analyses on survey data from 162 large and mid-sized manufacturing companies located in Germany. The researchers argue that companies with higher competencies in these three process steps of the upstream supply chain risk management show superior performance when it comes to the reduction of the frequency and impact of supply chain risks.

The findings provide evidence that supply chain risk activities support the operational and strategic preparedness of organizations towards a wide range of risks. The findings further lend credence to the notion that effective supply chain risk management processes significantly contribute to risk performance improvements. Even though the study sample covers a variety of industrial firms, the data were gathered solely within Germany. This limits the potential generalization of the study results to all types of businesses and economies. There is need therefore to apply the developed constructs to a broader sample of food and beverage manufacturers in developing countries such as Kenya.

2.7 Research gap

The empirical review indicates that many of the studies on supply chain risk management have been conducted in developed countries with few in developing nations (Dani & Deep, 2010). From literature, it is evident that limited studies have been carried out in the area of supply chain risk management especially in food and beverage manufacturing in Kenya. Even the empirical studies in the developed countries have tended to favour other business organizations (Waters, 2007). The concentration of the studies has been on the identification, classification of sources of SCR and supply chain risk management framework. However, these studies have not specifically addressed

supply chain risk management strategies influence on supply chain performance. Thus, an empirical gap can be identified in the current body of knowledge. This is the gap at which the core argument of this study aimed.

The incorporation of supply chain risk constructs and supply chain risk management strategies into supply chain management in food and beverage manufacturing is timely and reflects both theoretical imperatives and practitioner requirements. This research addresses the gap of inadequate research in the area of supply chain risk management strategies in food and beverage manufacturing in Kenya as shown by literature on supply chain risk management. The study tries to fill the knowledge gap on specific strategies that are employed by food and beverage manufacturing firms to build resilience and sustain growth. The study also addresses the gap on the relative lack of robust empirical studies on the influence of supply chain risk management strategies on the supply chain performance of food and beverage manufacturing firms in Kenya.

2.8 Summary of Literature Review

In summary, this chapter provided an extensive review of literature on supply chain risk management strategies and their influence on performance. Several researchers have proposed various SC risk management strategies: supply chain re-engineering, supply chain collaboration, agility, SC visibility and SC velocity, creating a SC risk management culture, postponement, strategic stock, flexible supply base, make and buy, economic supply incentives, flexible transportation, dynamic pricing and promotion, assortment planning, and silent product rollover.

The hypothesized relationships between the constructs in this study were manifested and presented in the form five research hypotheses anchored on six theories: contingency theory, relational theory, network theory, learning theory and RBV theory.

The study established that a number of studies in developed countries have focused on supply chain risk management in different industries such as retail industry, toy industry,

personal computer industry, consumer electronics industry and aerospace supply chain. There has been relatively little reported about the influence of supply chain risk management strategies on supply chain performance in food and beverage manufacturing firms. From the theoretical and empirical review, it is evident that the influence of supply chain risk management on performance of F & B manufacturing firms in Kenya is still an area for further research aimed at extending the existing knowledge.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter details the research methodology that was adopted by the study. The research methodology outlines how the study answered the research question systematically.This chapter is organized as follows: It explains the research design adopted for this study, the population, sampling frame, survey technique, data collection instruments, data collection procedure and finally explains data analysis and presentation.

3.2 Research Design

The research used an explanatory survey design. Explanatory research implies that the research in question is intended to explain, rather than simply to describe, the phenomena studied (Saunders, Lewis & Thornhill, 2009). The study intended to find out the influence of supply chain risk management strategies on performance. Such issues are best investigated through survey (Sekaran, 2006; Mugenda & Mugenda, 2012). In addition, according to Saunders, Lewis and Thornhill, (2009) the survey strategy tends to be important in descriptive, exploratory and explanatory research because it can collect a large amount of data from a sizeable population in an economical way. The design therefore enables the researcher to establish and explain the relationship between variables.

3.2.1 Research Philosophy

The research philosophy, or research paradigm, can be described as the overarching framework within which the researcher makes choices about theories and methodologies. Saunders defines it as the way that you think about the development of knowledge (Saunders *et al.,* 2009). Three research philosophies dominate the business

and management research field that is the paradigms of positivism, realism and interpretivism. The research philosophy adapted for this study is that of positivism. The positivist position is derived from that of natural science and is characterised by the testing of hypothesis developed from existing theory (hence deductive or theory testing) through measurement of observable social realities. This position presumes that theoretical models can be developed that are general sable, can explain cause and effect relationships, and which lend themselves to predicting outcomes(Johnson & Christensen 2010).Positivism is based upon values of reason, truth and validity and there is a focus purely on facts, gathered through direct observation and experience and measured empirically using quantitative methods – surveys and experiments - and statistical analysis (Saunders, *et al.,* 2009; Easterby-Smith, Thorpe & Jackson, 2008). Ericksson and Kovalainen (2008) relate this to the organisational context, stating that positivists assume that what truly happens in organisations can only be discovered through categorisation and scientific measurement of the behaviour of people and systems and that language is truly representative of the reality.

3.3 Research Population

Kombo and Dello (2006) define population as a group of individuals, objects or items from which samples are taken for measurement. The study administered a questionnaire to obtain primary data –the unit of analysis was the individual firm and the population was all 187KAM membership food and beverage manufacturing firms in Kenya. Target respondents were senior-level managers with the knowledge of supply-chain and logistics functions and direct involvement in strategic and operational decision-making. Such respondents were chosen as key organizational informants due to their set of skills, business responsibilities and SC expertise.

3.4 Sampling Frame

A sampling frame is a complete listing of all the units of the population which is purposely used to draw random samples (Mugenda *et al*, 2012). The sampling frame of

this study was the KAM registered 187 F& B manufacturing firms in Kenya. Kenya. The sampling frame was extracted from the KAM 2015 director. Census survey is the appropriate data collection design for a population of this size (Saunders *et al.,* 2009; Kothari, 2008).

3.5 Census Survey

This researcher collected data from I87 firms (Appendix 3) using the census survey technique. A census survey is the procedure of getting information from each member of the population (Saunders *et al.,* 2009; Kothari, 2008).Census survey is the appropriate data collection design for a small heterogeneous population. Since the sample frame for the study was small and heterogeneous, census survey was adopted. According to Kothari (2008) the larger the sample size for a small population, the more accurate the results are likely to be and hence the choice of the census technique in this study.

3.6 Data Collection Instrument

This study used questionnaire with both closed and open-ended questions (Appendix1) to collect information. The decision to use a questionnaire approach to data collection was consistent with the exploratory aspects of the research question, and the complexity of the issues involved (Wieland & Wallenbug, 2012; Xiao-Feng Shao, 2013). The study sought to find out the influence of supply chain risk management strategies on supply chain performance in food and beverage manufacturing firms. Since the study was concerned mainly with variables that could not be directly observed, questionnaires were used. Time constraints and sample size also dictated the use of questionnaires (Kombo & Dello, 2006; Mugenda & Mugenda, 2012; Saunders *et al*., 2009). The use of this instrument involves asking closed and open-ended questions. This method enables the researcher to collect more data on the phenomena under study. The questionnaires enabled the researcher to collect in-depth information in a flexible environment. This was important in the investigation of the problem (Kombo & Dello, 2006).

3.6.1 Questionnaire

A questionnaire (appendix 1) was administered to the sample of F&B manufacturing firms and literature research was conducted to identify supply chain risk management strategies. The questionnaire consisted of three sections. The purpose of section A was to solicit general information from food and beverage manufacturing firms. Section B sought information on: the nature of the business, supply chain risk management strategies that are used in the supply chain of the organisations while section C was about performance.A five-point Likert scalewas used to measure practitioners' perceptions of the extent to which different types of resources and activities achieve supply chain risk management.The end points were labelled 'Strongly disagree' (1) to 'Strongly agree' (5). The mid-point (3) was labelled 'Neutral'. SCRM strategies include agility, information sharing, postponement, contingency planning, collaboration, supplier selection, supply contracts, supply chain visibility, responsiveness, control and avoidance. The items were generated by reviewing relevant research literature in supply chain risk management. The measures of supply chain performance were adapted from Wong and Wong, (2008): quality, cost and delivery. This study reports in particular on the findings of section B of the questionnaire.

3.7 Data Collection Procedures

The researcher trained research assistants on the content of the questionnaire and the general research expectations. To enhance their practical skills on administration of the research instrument, the research assistants accompanied the researcher during the pilot study. During the main study, the researcher developed schedule appointments with respondents in the study. The schedule specified the date, time and place to administer the questionnaire. The research assistants were then sent to different regions to collect data from senior SC, logistics, or procurement managers of F& B manufacturing firms. The unit of study in this research was a KAM registered F& B firm. The objective of the study was to evaluate the influence of SCRM strategies on performance of F& B manufacturing firms in Kenya.

3.8 Pilot testing

Pilottest was a test collection of data to detect weaknesses in design and instrumentation and provide small scale data for selection of a probability sample (Johnson& Christensen, 2010). It is a pretest done prior to the main study to determine the accuracy of the research instrument in obtaining the required data (Mugenda *et al.*, 2012). A pilot study is a way to determine the feasibility of the study (Johnson & Christensen, 2010). The results from the pre-test were analyzed using SPSS to establish the internal consistency of items in each of the independent variables. Cronbach's Coefficient Alpha value 0.7 was the minimum acceptable for reliability measure (Nunnally, 1978). This determined how the questionnaire items correlate among themselves. The pilot test results were used to improve the research questionnaire.

Saunders *et al.* (2009) indicates that the ideal pilot study can be computed by taking 10% of the sample size. The survey population is 187 and hence the pilot sample size was 19.The sample for piloting did not form part of the research respondents.

Regarding the validity of the measures, categorical principal components analysis (CPCA) was used to evaluate the psychometric properties of the questionnaire. The technique attempts to reduce the dimensionality of a set of variables while accounting for much of the variation as possible (Linting & Meulman, 2007). The technique is the most suited for ordinal measurement (Linting & Meulman, 2007). To assess the unidimensionality of each construct, we tested the measurement models for convergent and discriminant validity (Hair, Black, Babin & Anderson, 2010).

A confirmatory factor analysis was used to test each construct individually and finally for the overall measurement model and each construct in the presence of other constructs (Hair *et al.,* 2010). The final number of items used to measure each construct was adjusted accordingly. Construct validity was assessed through convergent and discriminant validity. Convergent validity describes the convergence of different

measures of the same construct on a common statistical factor. Discriminant validity evaluates how measures of different constructs load on different factors.

3.9 Data Analysis and Presentation

The data was analyzed using both descriptive measures and exploratory factor analysis to identify and validate the items contributing to each component in the model. Structural equation modeling (SEM)-R, Lavaan 20has been commonly used in recent years as a basis for theory development and testing in supply chain management, and other related disciplines (Wallenburg &Weber, 2005; Park, 2011; Wieland & Wallenbug, 2012; Xiao-Feng Shao, 2013). One of the advantages of structural equation modeling is the possibility to also look at indirect effects between latent constructs. It means that all hypothesized relationships could be tested simultaneously while indirect and direct effects on the endogenous variables could be separated.

The study proposed that supply chain risk management strategies (SCRM) have an important influence on SC performance. A structural equation model was used in this study to analyze the influence of SCRM on this performance as shown in Figure 3.0. Firstly, the study tested the fitness of the overall SEM model based on the main hypothesis. Then secondly, the study looked at the particular research hypotheses of the study.

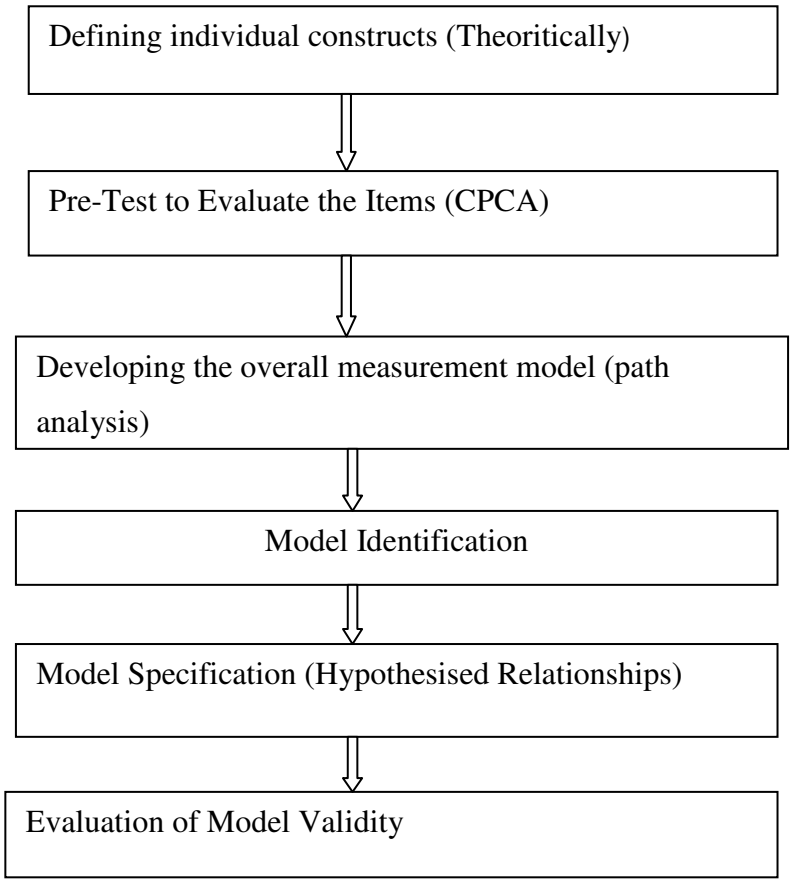

Figure 3.1: Steps used in building the SEM model

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

This study focused on finding out the influence of supply chain risk management strategies on supply chain performance of food and beverage manufacturing firms in Kenya. The supply chain risk management strategies include flexibility, supply chain collaboration, supply base rationalisation strategy, risk control and risk avoidance. The analysis was done using statistical package for social sciences (SPSS) version 24 and R-Lavaan 0.5-20. The tabulation of the results is based on the data collected by use of the questionnaire.

4.2 Response Rate

Out of the administered 187 questionnaires, 165 were returned fully completed. The response rate is shown in Table 4.1. This represents a significant 87.3 percent response rate which was deemed adequate for further analysis (Saass, Schmitt, & Marsh, 2014).

Table 4.1: Case Processing Summary

Valid Active Cases	**165**
Active Cases of with Missing Values	0
Supplementary Cases	22
Total	187
Cases Used in Analysis	165

4.3 Pilot Test and Validity of Instrument

The questionnaire was pilot tested on 10% of the members of the sampling frame. A total of 19 firms responded during the pilot survey. After recording all the completed responses, the data was into SPSS 17 software for further analysis. At the preliminary stage the survey responses were examined for errors and missing data. Surveys completed in their entirety accounted for 100% of all collected.

The summary of statistics for the pilot study is presented in APPENDIX 4. Means and standard deviations were measured for each of the 41 substantive scale items and the normality analysis was conducted. Most items were worded as statements and most response choices were based on a five-point scale ranging from "strongly disagree" to "strongly agree. Mean values ranged from 2.05 to 4.11, while the standard deviations ranged from 0.976 to 1.427. The items with low mean score were deleted. The normality assumption was also tested, and the measures of kurtosis for each of the items are presented in APPENDIX 4 as well. Twelve scaled items raised concerns in terms of the normality distribution based on kurtosis values ranging from -1.213 to 1.085. Some items raised concerns. Several outliers were identified and eliminated.

4.3.1 Principal Component Analysis (PCA)

Principal Component Analysis(PCA) is appropriate for data reduction when there are several variables.These tests were computed to select and assess the final items of the constructs that would be utilized for further statistical and hypotheses testing(Hair *et al.,* 2013). KMO & Bartlett's Test of Sphericity is a measure of sampling adequacy that is recommended to check the case to variable ratio for the analysis (Table 4.2). The KMO ranges from 0 to 1, anything above 0.6 is acceptable. The Bartlett's Test of Sphericity relates to the significance of the study and thereby shows the validity and suitability of the responses collected for the study. Bartlett's Test of Sphericity must be less than 0.05. The result provided evidence to support the theoretical conceptualization of the constructs. Table 4.2 shows the summary of the PCA model.

Table 4.2: PCA Summary Model

KMO &Bartlett's Test of Sphericity		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.901
Bartlett's Test of Sphericity	Approx. Chi-Square	157.072
	Df	15
	Sig.	.000

4.3.2 Extraction Communalities

The communality for a given variable can be interpreted as the proportion of variation in that variable explained by the factors. The individual communalities tell how well the model is working for the individual variables (APPENDIX 5), and the total communality gives an overall assessment of the model. The extraction communalities for all the 37items were found acceptable (≥0.500), although eight items had lower values (≤0.800) namely: Sharing of information with supply chain partners with regards to contingency plans; Preparation of a set of action plans for unexpected disruptions; Quick reorganize supply chain resources immediately to respond to supply chain risks; is informed of the changing trends in business; Contracts with selected suppliers to reduce supply risks; Collaborative long term relationship with the suppliers to minimize supply risks; Centralised decision making; Adequate financial resources; Having business continuity plans; Use our own products in manufacturing; Using order policy to determine quality.

4.3.3 Refined Items

The coefficient Cronbach's alpha provides a summary measure of the inter-correlation that exists among a set of refined items. Cronbach's alpha values for each of the six factors are given in Table 4.3 below along with their scale mean and SDs. The reliability

value, Cronbach's alpha for each of the factor is above 0.80, which exceeded the threshold point of 0.70 suggested by Nunnally (1978).

Table 4.3: Refined Items/ Alpha Cronbach

Latent Variables	Item Mean	Item SD	Alpha Cronbach
Flexibility Strategies	3.44	1.24	0.808
Collaboration Strategies	3.61	1.24	0.897
Supply Base Rationalisation	3.55	1.22	0.880
Control Strategies	3.43	1.24	0.859
Avoidance Strategies	3.58	1.28	0.881
Dependent Variable Sc Performance	3.47	1.13	0.899

4.3.4 Total Communalities

The total communality for the refined variables gives an acceptable overall assessment of the model as shown in Table 4.4.The extraction communalities for all variables were found acceptable (≥0.500).

Table 4.4: Total Communalities

	Initial	Extraction
Flexibility	1.000	.814
Collaboration	1.000	.882
Rationalisation	1.000	.949
Control Strategy	1.000	.926
Avoidance Strategy	1.000	.959
Sc Performance	1.000	.853

Extraction Method: Principal Component Analysis.

4.4 Demographic Statistics

4.4.1 Gender of the Respondents

The study sought to establish the gender of respondents in the study. The following information (Table 4.5) was obtained from the respondents.

Table 4.5 Gender of the Respondents

	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Male	95	57.6	57.6	57.6
	Female	70	42.4	42.4	100.0
	Total	165	100.0	100.0	

The majority of the respondents were male (57.6 per cent) compared to 42.4 percent female. The results show that there is still slight gender disparity in management of manufacturing firms. These findings are in line with the findings of Council for International Development Co-operation [CIDC] (2014) who found that there are gender disparities in employment and pay of the manufacturing firms' workforce in Kenya. The

results of this study suggest that access to managerial manufacturing jobs is in favour of males.

4.4.2 Qualification of the Respondents

The study sought to find out the level of education of the respondents and established that the management is composed of well educated personnel as shown in Table 4.6 below.

Table 4.6: Respondents Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	5	3.0	3.0	3.0
	Bachelor's degree	77	46.7	46.7	49.7
	Master's degree	61	37.0	37.0	86.7
	PhD	3	1.8	1.8	88.5
	Other	19	11.5	11.5	100.0
	Total	165	100.0	100.0	

The results show that majority (47%) had attained a university first degree. Thirty seven percent (37%) had master degree while minority (3%) had a diploma whereas the rest (12%) did not specify. These findings, illustrated in table 4.6, indicate that the management in the food and beverage manufacturing sector has relatively high level of education and exposure.These findings are similar to the findings of CIDC (2014) which states that Kenya's labour force is well educated and relatively mobile. This implies that there is relatively high potential for thorough understanding of supply chain risk management issues (Choi *et al.,* 2012).

4.4.3Categories of Firms

The respondents were asked to indicate the category of their food and beverage manufacturing firms. The results are shown in Table 4.7 below.

Table 4.7: Categories of Firms

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Alcoholic beverages and spirits	7	4.2	4.2	4.2
	Cocoa, chocolate and sugar confectionaries	35	21.2	21.2	25.4
	Dairy products	39	23.6	23.6	49
	Juices, water and carbonated soft drinks	57	34.5	34.5	83.5
	Meat and meat products	13	7.9	7.9	91.4
	Vegetable oils.	9	8.6	8.6	100
	Total	165	100.0	100.0	

The breakdown of the main test survey respondents by industry is presented in Table 4.7. Results indicate that the majority of the main test survey participants were from Juices, water and carbonated soft drink (34.5 percent). The dairy sub sector and confectionaries contributed 23.6 percent and 21.2 percent of participants respectively. Participants from the vegetable oil accounted for an additional 8.6 percent. The rest (7.9 percent) were from the meat and meat products. The results suggest that juices, water and carbonated soft drinks as well as dairy and confectionaries are the majority in the food and beverage manufacturing industry. This is in line with KAM (2014) report on sub sector contribution to the manufacturing industry.

4.5 Supply Chain Risk Management Strategies

4.5.1 Influence of SC Flexibility Strategies on Performance of F&B Manufacturing Firms

Analysis of the study parameters in Table 4.8 revealed that flexibility strategies influence SC performance. Storage of materials at appropriate locations (near customers) had the highest mean score of 3.56 as 58% agreed, 20% were neutral while 22% disagreed with the observation. The study revealed that delaying final assembly activities had the mean score of 3.43 as 22% agreed and 27 % strongly agreed with the same. It was also revealed that re-arranging production processes for customization influence performance as this parameter had a mean score of 3.42. 23% of the respondents strongly agreed with 29% agreeing that such SC practices influence performance. The study found out that delaying processes until customer orders are received influence SC performance. The factor had the mean score of 3.42 as 48% of the respondents were positive while 28% disagreed. With regards to flexibility to accommodate customer requirements is concerned, the factor had a mean score of 3.38. 29% of the respondents strongly agreed, 21% agreed while 31% disagreed with this fact.

The research findings agree with those of Gligor and Holcomb (2012) that found out that firms that achieve higher levels of flexibility and agility significantly outperform their less flexible counterparts. Flexible firms are more innovative, dynamic and responsive to changes and challenges. Hence, flexibility positively impacts its ability to enhance comparative performance relative to leading industry competitors. This study concludes that ssupply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms.

Table 4.8: SC Flexibility Strategies Influence on Performance of F&B Manufacturing

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
F1Delays final product assembly activities until the last possible position (or nearest to customers) in the supply chain	6	21	24	22	27	3.43	1.260
F2 Stores items at appropriate distribution points close to the customers in the supply	4	19	20	33	24	3.56	1.155
F3 Can re-arrange production processes so that customization can be carried out later	4.2	23.6	20.6	28.5	23	3.42	1.20
F4 Delays final product assembly activities until customer orders have actually been received	6	22	24	22	27	3.42	1.250
F5 Accommodate several customer service requirements	6	27	18	21	29	3.38	1.313

4.5.2 Influence of SC Collaboration Strategies on Performance of F&B Manufacturing Firms

The study found out that F&B manufacturing firms use information technology to reduce risk thereby improving performance. This parameter had the highest mean score of 3.65 as 60% of the respondents agreed but 25% of the respondents disagreeing with the same. As far as exchange of information and performance rate is concerned, 55% of

the respondents agreed as 19% disagreed in a five scale Likert. The study also established that frequent and timely exchange of information had a great influence SC performance as 33% strongly agreed with 26% agreeing with the same. The parameter had a mean score of 3.64.

Collaboration with SC partners has influence on SC performance since, 24% of the respondents strongly agreed with 33% agreeing. 15% of the respondents however disagreed with 4% strongly disagreeing. The influence of SC partners' involvement in design and marketing on performance had a mean score of 3.64. 30% of the respondents strongly agreed with 30% agreeing as 13% disagreed and 6% strongly disagreeing as shown in Table 4.9.

These findings support Wieland and Wallenburg (2012) who found that communicative and collaborative relationships have a positive effect on SC resilience. It is also found that improved resilience, obtained by investing in agility and robustness, enhances a supply chain's customer value. Similary, Srinivasan *et al.* (2011) stated that building trust in relationships contribute to reduction of supply chain related risks. Hence there will be a positive relationship between SC collaborative risk management strategies and performance of food and beverage manufacturing firms.

Table 4.9: SC Collaboration Strategies Influence on Performance of F&B Manufacturing Firms

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
CO1 Exchange of information that helps in the reducing supply chain risks	7	12	26	29	26	3.53	1.202
CO2 Frequent and timely exchange of information about events or changes that may affect business	6	15	24	33	24	3.64	1.249
CO3 Collaboration with supply chain partners	4	15	24	33	24	3.58	1.138
CO4 Involvement of supply chain partners in the new product design development effort and marketing	6	13	22	30	30	3.64	1.204
CO5 Information technology is used to reduce supply chain risks	9	16	15	22	38	3.65	1.365

4.5.3 Influence of Supply Base Rationalisation Strategies on Performance of F&B Manufacturing Firms

The study sought to establish whether supply base rationalisation influence performance. The indicator of sourcing form multiple local suppliers had the highest mean score of 3.66 as 33% of the respondents strongly agreed and 27% agreed with the practice. A total of 23% of the respondents however disagreed with the same. The study revealed that sourcing from multiple foreign suppliers does influence performance. The indicator

had a mean score of 3.55. Fifty five percent (55%) of the respondents agreed with the sentiments as only 23% disagreed with the same. When the respondents were asked to indicate whether sourcing from few local and few foreign suppliers influenced SC performance, 26% of the respondents strongly agreed, and 32% agreed while 15% of the respondents disagreed with 6% strongly disagreed.

The study sought to find out how sourcing from few local suppliers influence SC performance. With mean of 3.49, 26% of the respondents strongly agreed with 29% agreeing. However, 22% of the respondents disagreed with 5% strongly disagreeing. Sourcing from suppliers who have been evaluated and selected had high influence (mean=3.55). Twenty six percent (26%) strongly agreed as 32% agreed that the practice had influence on performance. A total of 27% of the respondents however disagreed with the practice as illustrated in Table 4.10.

These findings are in line with those of Ponomarov (2012) that supplier rationalisation based on quality, pricing, delivery and performance of product have significant relationship with four elements of customer satisfaction -product quality, product variety, delivery service and competitive pricing- and firm performance.Musa and Tang, (2012) also stated that supplier base rationalizationnarrow the domain and severity of risk to which an exchange is exposed, and thereby encourage cooperation and trust. Thus the study concludes that ssupplier base rationalization risk strategies have positive influence on performance of food and beverage manufacturing firms.

Table 4.10: SBR Influence on Performance of F&B Manufacturing Firms

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
SBR1:Sourcing from multiple local suppliers to minimize the likelihood of supply chain risks	4	19	17	27	33	3.66	1.222
SBR2 Sourcing from multiple foreign suppliers to minimize losses	4	19	22	27	27	3.55	1.186
SBR3 Sourcing from a few local and foreign suppliers	6.	15	21	32	26	3.56	1.196
SBR4 Sourcing from a few local suppliers only to minimize risks	5	22	19	29	26	3.49	1.228
SBR5 Sourcing from suppliers who have been evaluated and selected to reduce supply risks	6	21	16	32	26	3.55	1.386

4.5.4 Influence of Supply Chain Control Strategies on Performance

The study sought to establish whether supply chain control strategies influence performance. The indicator of holding buffer stock had the highest mean score of 3.45 as 23% of the respondents strongly agreed and 29% agreed with the practice. Twenty one percent (21%) of the respondents however disagreed while 4% strongly disagreed with the SC practice. The study revealed that keeping extra strategic inventory does influence performance of F&B manufacturing firms. The indicator had a mean score of 3.43. Fifty five percent (55%) of the respondents agreed with the sentiments as only 26% disagreed with the same. When the respondents were asked to indicate whether holding

underutilized capacity to serve a cushion influenced SC performance, 28% of the respondents strongly agreed, and 26% agreed while 21% of the respondents disagreed with 8% strongly disagreed as shown in Table 4.11.

The study sought to establish whether the firms used improved forecasting techniques to influence SC performance. With mean of 3.45, 28% of the respondents strongly agreed with 22% agreeing. However, 16% of the respondents disagreed with 9% strongly disagreeing with the practice. Monitoring SC systems for risks had the lowest influence (mean=3.38). Twenty percent (20%) strongly agreed as 29% agreed that the practice had influence on performance. Twenty one percent (21%) of the respondents disagreed and 5% strongly disagreed with the practice.

The research findings agree with Lockamy (2014) findings that companies have been implementing different strategies and philosophies to control inventory, to eliminate waste, bring continuous improvement, to improve forecasting and improved efficiency and responsiveness. This study concludes that supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firm.

Table 4.11: SC Control Strategies Influence on Performance of F&B Manufacturing Firms

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
CS1Holding of buffer stock to mitigate the risk of stock-out	4	21	23	29	23	3.45	1.176
CS2 Keeping extra inventory of strategic items (e.g. raw materials parts, and finished goods)	9	17	19	32	23	3.43	1.265
CS3Holding of underutilized capacity which serves as a cushion to any disruptions	8	21	18	26	28	3.45	1.304
CS4Using improved forecasting techniques to reduce risks associated with supply chain	9	16	26	22	28	3.45	1.280
CS5 Regular monitoring of supply chain risks (demand, supply process and environmental risks	5	21	26	29	20	3.38	1.165

4.5.5 Influence of Supply Chain Avoidance Strategies on Performance of F&B Manufacturing Firms

The analysis Table 4.12 shows that SC avoidance strategies influence performance. The indicator of avoiding certain geographical markets deemed risky had a mean score of 3.50 as 33% of the respondents strongly agreed and 21% agreed with the practice. Twenty one percent (21%) of the respondents however disagreed while 7% strongly disagreed with the SC practice. The study also revealed that avoiding some supplier to minimize risk does influence performance of F&B manufacturing firms. The indicator

had a mean score of 3.45. Twenty five percent (25%) of the respondents strongly agreed and 30% agreed with the same. Ten percent (10%) strongly disagreed while 16% disagreed with the fact. Then the respondents were asked to indicate whether delaying getting into some markets to avoid risks influenced SC performance, 29% of the respondents strongly agreed, and 30% agreed while 19% of the respondents disagreed with 6% strongly disagreeing with the strategy.

The respondents were asked whether auditing the firm processes and those of their suppliers contributed to SC performance. With mean of 3.50, 29% of the respondents strongly agreed with 23% agreeing. However, 19% of the respondents disagreed with 6% strongly disagreeing with the strategy. The use of information technology to reduce risks had the highest mean score of 3.86. Forty four percent (44%) strongly agreed as 24% agreed that the strategy had influence on performance. Sixteen percent (16%) of the respondents disagreed while 6% strongly disagreed with the practice.

The study findings tally with those ofChristopher and Holweg (2011) who found out thatsupply chains operating in all types of environments attempt to avoid risks within the constraints of acceptable returns such as revenue and profit targets. Hence avoidance strategies lead to better SC performance. This study concludes that SC risk avoidance strategies have positive relationship with performance of food and beverage manufacturing firms.

Table 4.12: SC Avoidance Strategies Influence on Performance of F&B Manufacturing Firms

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
A1Avoids geographical markets deemed risky	7	21	18	21	33	3.50	1.333
A2 Avoids some suppliers in order to minimize supply chain risks	10	16	19	30	25	3.45	1.285
A3 Delays getting into certain markets until the uncertainty is reduced	6	19	16	30	29	3.58	1.125
A4 Audits both our processes and supplier processes to minimize quality risks	6	19	23	23	29	3.50	1.257
A5 Information technology is used to reduce supply chain risks	6	16	10	24	44	3.86	1.287

4.6 Supply Chain Performance

Supply chain performance measurement is the process of qualifying the efficiency and effectiveness of the supply chain (Wong & Wong, 2008). Supply chain performance measurement includes multiple dimensions including financial and non-financial metrics describing costs, capacity, lead times and service levels (Bigliardi & Bottani, 2014). SCM could be measured at various management or operation levels. Strategic level measures influence top management decisions and also very often reflects investigation of broad based policies and level of adherence to organisational goals (Chopra *et al*.,

2007). The tactical level deals with resource allocation and measuring performance against targets to be met in order to achieve results specified at the strategic level. At the operational level, metrics are relevant for day to day business. The main metrics of a firm's operation performance are based (1) cost; (2) quality; (3) flexibility; (4) delivery; (5) customer service level. Recent studies on supply chain management have suggested that these priorities can be categorised into two fundamental dimensions: efficiency and responsiveness (Chopra *et al*., 2007).

The term efficiency refers to the ability of a supply chain to compete on costs. It is usually best suited to serve markets with predictable demands and for which the products have a long life cycle. The term responsiveness refers to the ability of a supply chain to respond quickly to market movements. In designing a responsive supply chain, the emphasis will be on quick and fast deliveries (Chopra *et al.,* 2007). Based on the operational priorities, this study adopted three metrics: cost, quality, delivery and customer service levels as proposed by researchers (Wong & Wong, 2008; Sherperd & Gunter, 2006; Bigliardi & Bottani, 2014)

Respondents were asked whether their firms' supply chain operations achieved the lowest possible costs. Thirty seven percent (54%) of the respondents agreed while 17% disagreed. On whether the firms had the ability to reduce time between order and delivery, 53% of the respondents agreed while 23% disagreed. The study also revealed that SC strategies influenced the ability of the firms to meet quoted qualities and quantities consistently. Nineteen percent (19%) strongly agreed, 33% agreed while 16 % disagreed and 7% strongly disagreed. It was also established that SC performance measured up to customer service levels. Twenty eight percent (28%) strongly agreed, 33% agreed but 16% disagreed as 6% strongly disagreed as shown in Table 4.13.

Table 4.13: SC Performance

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
SCP1 The ability to achieve the lowest possible cost of logistics through efficient operations and/or scale economies	2	15	20	33	21	3.51	1.281
SCP2 The ability to reduce the time between order receipt and customer delivery to as close to zero as possible	5	18	24	34	19	3.45	1.134
SCP3 The ability to meet quoted or anticipated quality and quantities on a consistent basis	7	19	19	36	19	3.41	1.199
SCP4 The extent to which perceived supply chain performance matches customer expectations	6	16	18	33	28	3.62	1.201

4.7 Structural Equation Modelling (SEM)

This study used structural equation modelling for inferential statistics. Structural equation modelling (SEM) is a statistical technique used to explain the covariance among a set of variables (Hair*et al.,* 2013) as shown in Table 4.14.SEMs are most appropriately used in a confirmatory to test a theory that explains the relationships among a group of variables. These relationships are specified prior to theory testing and inform data collection (Hair*et al.,* 2013).

Table 4.14: Covariances

Covariances:

	Estimate	Std.Err	Z-value	P(>|z|)	Std.lv	Std.all
FLEX ~~						
COLL	0.934	0.032	29.591	0.000	0.934	0.934
SBR	0.968	0.032	29.957	0.000	0.968	0.968
CS	0.945	0.031	30.015	0.000	0.945	0.945
AS	0.928	0.032	29.207	0.000	0.928	0.928
COLL ~~						
SBR	0.914	0.034	27.170	0.000	0.914	0.914
CS	0.885	0.033	26.742	0.000	0.885	0.885
AS	0.921	0.029	32.196	0.000	0.921	0.921
SBR ~~						
CS	0.872	0.044	19.807	0.000	0.872	0.872
AS	0.861	0.040	21.738	0.000	0.861	0.861
CS ~~						
AS	0.892	0.039	23.157	0.000	0.892	0.892

The hypothesized factor analysis model is presented in Figure 4.0 as a path diagram. In this model a six factor model is hypothesized: Performance, Flexibility, Collaboration, Rationalisation, Control and Avoidance. Performance is related to cost (SCP1), delivery (SCP2), quality (SCP3) and customer service (SCP4), Flexibility is related with postponement (SCFS1& 2); agility (SCFS3, SCSF4 & SCFS5), Collaboration is related

to information sharing(SCOL1&SCOL 2); SC visibility (SCOL3& SCOL4) and information technology (SCOL5); Rationalisation is related to mixed sourcing (SBR1& SBR2) localised sourcing (SBR3 &SBR4)and supplier selection (SBR5); Control is related to inventory management (CS1, CS2)capacity (CS3), and continuous improvement (SCCS4&SCCS5); and Avoidance is related with avoiding risk market(SCAS1), avoiding some suppliers(SCAS2), delaying entry (SCAS3), auditing processes (SCAS4)and using information technology(SCAS5).

By the notation used in SEM analysis (Kline, 2011), observed variables are represented by squares and labelled by their respective SPSS variable names, latent variables are represented by circles and labelled with Performance, Flexibility, Collaboration, Rationalisation, Control and Avoidance, which are also called common factors. Each of the observed variables and the endogenous variable "Performance" have an error variable which are labelled with e1-e5, f1-f5, c1-c5, r1-r5, rc1-rc5, and a1-a5. Absence of a connection line between two variables implies no hypothesized direct effect.

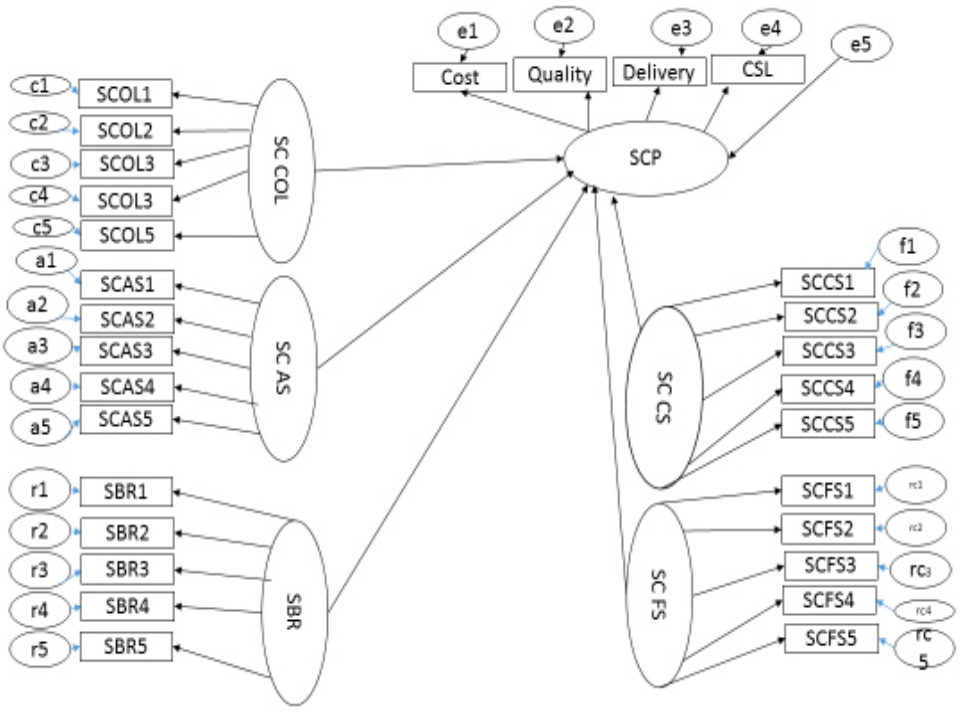

Figure 4.1: Structural Path Diagram Model

4.7.1Confirmatory Factor Analysis Model Estimation

The weighted least squares mean and variance adjusted (WLSMV) estimator was used to estimate all models (Table 4.15). WLSMV is robust estimation technique is useful when data are coarsely categorized or follow nonormal distributions (Sass *et al.,* 2014). The robust techniques apply rescaling corrections or use alternative calculation procedures to other estimation methods to overcome shortcomings (Appendix 7) .WLSMV estimator has been found to perform better than with small sample sizes with categorical responses. WLSMV based parameter estimates have show little bias, even when nonnormally distributed ordinal data with few categories are analyzed (Rhemtulla, Brosseau-Liard & Savalei, 2012).

Table 4.15: Model Estimation Technique

```
>summary(p.m, standardized=TRUE)

lavaan (0.5-20) converged normally after 128 iterations


  Number of observations                           165


  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic              302.919     435.165
  Degrees of freedom                               362         362
  P-value (Chi-square)                           0.989       0.005
  Scaling correction factor                                  1.208
  Shift parameter                                          184.307
for simple second-order correction (Mplus variant)


Parameter Estimates:


  Information                                 Expected
  Standard Errors                           Robust.sem
```

Confirmatory factor analysis results for the measurement model provided evidence for convergent validity because all items exceeded the recommended factor loading threshold of 0.5. Unidimensionality is achieved when the items have acceptable factor loadings that are 0.5 or higher (Hair *et al.*, 2010). Reliability is the extent to which the items are consistently measuring the intended latent construct. To satisfy the reliability

criterion, a Cronbach's alpha value of more than or equal to 0.7 is required (Nunnally, 1978). The results of the unidimensionality and reliability analysis for all the constructs are shown in Table 4.16. Items which have factor loadings less than 0.5 were deleted and all the constructs were shown to be reliable.

Table 4.16: Parameter Estimates

```
Latent Variables:
                   Estimate  Std.Err  Z-value   P(>|z|)  Std.lv  Std.all
  FLEX =~
    FLEXIBILTY1       0.702    0.042   16.811    0.000    0.702
0.702
    FLEXIBILITY2      0.777    0.036   21.606    0.000    0.777
0.777
    FLEXIBILITY3      0.667    0.044   15.286    0.000    0.667
0.667
    FLEXIBILITY4      0.639    0.049   12.931    0.000    0.639
0.639
    FLEXIBILTRY5      0.736    0.042   17.551    0.000    0.736
0.736
  COLL =~
    COLLABORATION1    0.815    0.031   26.471    0.000    0.815
0.815
    COLLABORATION2    0.833    0.032   25.941    0.000    0.833
0.833
    COLLABORATION3    0.830    0.028   29.242    0.000    0.830
0.830
    COLLABORATION4    0.824    0.026   31.285    0.000    0.824
0.824
    COLLABORATION5    0.776    0.037   20.789    0.000    0.776
0.776
```

```
  SBR =~

    SBR1              0.818    0.035   23.215    0.000    0.818
0.818

    SBR2              0.816    0.032   25.615    0.000    0.816
0.816

    SBR3              0.802    0.035   23.085    0.000    0.802
0.802

    SBR4              0.748    0.040   18.547    0.000    0.748
0.748

    SBR5              0.769    0.037   20.676    0.000    0.769
0.769

  CS =~

    CS1               0.781    0.037   20.998    0.000    0.781
0.781

    CS2               0.781    0.038   20.685    0.000    0.781
0.781

    CS3               0.783    0.041   18.943    0.000    0.783
0.783

    CS4               0.777    0.035   21.915    0.000    0.777
0.777

    CS5               0.693    0.047   14.830    0.000    0.693
0.693

  AS =~

    AS1               0.749    0.045   16.834    0.000    0.749
0.749

    AS2               0.822    0.033   25.073    0.000    0.822
0.822

    AS3               0.764    0.036   21.026    0.000    0.764
0.764

    AS4               0.798    0.035   22.732    0.000    0.798
0.798

    AS5               0.891    0.025   35.048    0.000    0.891
0.891
```

```
  SCP =~

    SCP1              0.408    0.084    4.865    0.000    0.804
0.804

    SCP2              0.435    0.089    4.877    0.000    0.858
0.858

    SCP3              0.452    0.091    4.956    0.000    0.890
0.890

    SCP4              0.472    0.094    4.998    0.000    0.930
0.930
```

4.7.2 Model Evaluation Criteria: Goodness of Fit

The model fitting process in SEM involves determining the goodness-of fit between the hypothesized model and the sample data (Sass, *et al.,* 2014). Goodness of fit shows how well the specified model reproduces the observed covariance matrix among the indicator items.

Model Chi-square (χ2)

The Chi-Square value is the conventional measure for evaluating overall model fit and, assesses the level of discrepancy between the sample and fitted covariance matrices (Sass *et al*., 2014). A good model fit would provide an insignificant result at a 0.05 threshold (Rhemtulla *et al.,* 2012). Chi-square and p-value-- the higher the probability level (p value) associated with chi square, the better the fit.

Standardized Root Mean Square Residual (SRMR) Index

The Standardized Root Mean Square Residual (SRMR) is an index of the average of standardized residuals between the observed and the hypothesized covariance matrices (Chen, 2007). SRMR (standardized RMR, root mean square residual). SRMR less than 0.05 means good fit. The smaller the SRMR, the better the model fit. SRMR equal to 0

indicates perfect fit. A value less than 0.08 is considered good fit. (Kline, 2011). One of the reasons of preferring SRMR index in studies is its relative independence from sample size (Chen, 2007).

Comparative Fit Index (CFI)

The Comparative Fit Index (CFI) is an incremental fit indices. This index compares the existing model fit with a fit of the model that assumes uncorrelated latent variables. In general, CFI index could range from 0 to 1. CFI close to 1 indicates a very good fit, greater than 0.9 or close to 0.95 indicates good fit, by convention, CFI should be equal to or greater than 0.90 to accept the model. CFI is independent of sample size (Rhemtulla *et al.,* 2012).

The root mean square error of approximation (RMSEA)

The root mean square error of approximation (RMSEA) measures absolute fit of the proposed model by comparing the average difference per degree of freedom expected to occur in the population. This measure is not affected by sample size and is considered reliable. There is good model fit if RMSEA less than or equal to .05. There is adequate fit if RMSEA is less than or equal to 0.08.

Goodness-of-fit statistic (GFI) and the adjusted goodness-of-fit statistic (AGFI)

The Goodness-of-Fit statistic (GFI) was created as an alternative to the Chi-Square test and calculates the proportion of variance that is accounted for by the estimated population covariance (Chen, 2007). By looking at the variances and covariances accounted for by the model it shows how closely the model comes to replicating the observed covariance matrix (Rhemtulla *et al.,* 2012). This statistic ranges from 0 to 1 with larger samples increasing its value. The GFI should by equal to or greater than .90 to indicate good fit. A value of 1 indicates a perfect fit

Normed-fit index (NFI)

This statistic assesses the model by comparing the $\chi 2$ value of the model to the $\chi 2$ of the null model. The null/independence model is the worst case scenario as it specifies that all measured variables are uncorrelated. Values for this statistic range between 0 and 1. Values greater than 0.90 indicate a good fit (Rhemtulla *et al.,* 2012).

Non-Normed Fit Index (NNFI, also known as the Tucker-Lewis index)

Non-Normed Fit Index (NNFI, also known as the Tucker-Lewis index), an index that prefers simpler models. However in situations were small samples are used, the value of the NNFI can indicate poor fit despite other statistics pointing towards good fit (Kline, 2011). NNFI close to 1 indicates a good fit. By convention, NNFI values below .90 indicate a need to re-specify the model. Tucker-Lewis Index (TLI) The TLI is an incremental fit index. The bigger TLI value indicated better fit for the model. Although values larger than 0.95 are interpreted as acceptable fit, 0.97 is accepted as the cut-off value in a great deal of researches (Sass, *et al.,* 2014). The developed model has been proven to meet all the requirements and the results are shown in Table 4.17.

Table 4.17: Summary of Goodness of Fit

Name of index	Index value	Comment
CFI (≥0.9)	1.000	CFI > 0.95
GFI(≥0.90)	0.993	GFI > 0.95
TLI (≥0.9)	1.002	TLI > 0.95
NNFI(≥0.9)	1.002	NNFI > 0.90
RMSEA (≤0.08)	0.000	RMSEA < 0.05
WRMR	0.762	
CHISQ/ DF	302.919/ 362.000	
P VALUE (≥0.5)	0.989	p-value > 0.05

4.8 Path Analysis

The structural model results and the standardized regression weights are presented in Figure 4.1. It is hypothesized that SC flexibility strategies have a significant and positive influence on performance. The direct path from supply chain flexibility strategies to performance was significant (0.187; p<, 0.005). The results show that H1 is supported as shown by the standardized coefficient of 0.187 at a significance level of less than 0.005. The results support the previous research by Gligor and Holcomb (2012) that found out that firms that achieve higher levels of flexibility and agility significantly outperform their less flexible counterparts.

The path from SC collaboration to SC performance was also significant (0.131; p<0.005), in the direction hypothesized. The data supported the hypothesis that supply chain collaboration strategies influence performance of F&B manufacturing firms.

These findings support Wieland and Wallenburg (2012) who found that communicative and collaborative relationships have a positive effect on performance.

The path from SC base rationalisation to SC performance was also significant (0.182; p<0.005), in the direction hypothesized. The data supported the hypothesis that supply chain collaboration strategies influence performance of F&B manufacturing firms. The results support previous studies by Musa & Tang, (2012) and Ponomarov (2012) that supplier rationalisation based on quality, pricing, delivery and performance of product have significant relationship with four elements of customer satisfaction -product quality, product variety, delivery service and competitive pricing- and firm performance.

The path from SC control strategies to SC performance was also significant (0.250; p<0.000), in the direction hypothesized. The data supported the hypothesis that supply chain control strategies influence performance of F&B manufacturing firms. The research findings agree with Lockamy (2014) findings that companies have been implementing different strategies and philosophies to control supply chain risks and improve performance.

The path from SC avoidance to SC performance was also significant (0.274; p<0.004), in the direction hypothesized. The data supported the hypothesis that supply chain avoidance strategies influence performance of F&B manufacturing firms. The results support previous studies by Christopher and Holweg (2011) who found out that supply chains operating in all types of environments attempt to avoid risks within the constraints of acceptable returns to improve their performance.

Looking at the individual SCRM strategies (Figure 4.1), the ranking order of SCRM strategies employed by the F&B manufacturing firms are SC avoidance strategies (0.274; p,0.000) SC control strategies (0.250;p,0.000) SC flexibility strategies (0.187; p,0.005), SC base rationalisation strategies (0.182; p,0.004), SC collaboration strategies (0.131; p,0.005).

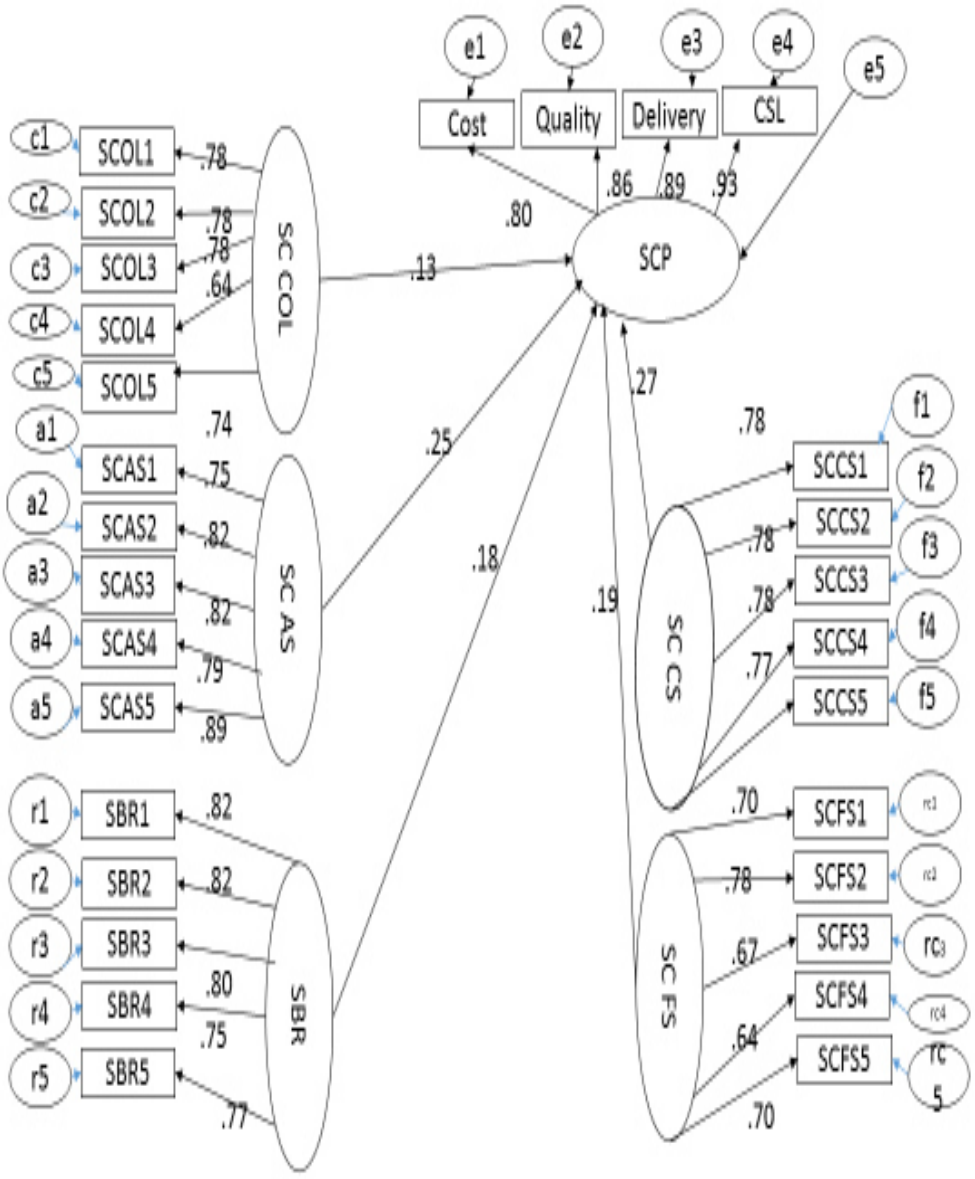

Figure 4.2: The Structural Model Tested

4.9 Hypothesis Testing Results

H_1: Supply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Supply chain risk flexibility strategies have standardized loading of 1.70 and a Z-value of 8.228 on performance. The relation is positive and significant at 1% level as the p-value associated with the critical ratio is less than 0.001as shown in Table 4.18.The research findings agree with those of Gligor and Holcomb (2012) that found out that firms that achieve higher levels of flexibility and agility significantly outperform their less flexible counterparts. Flexible firms are more innovative, dynamic and responsive to changes and challenges. Therefore, Supply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Table 4.18: SC Flexibility Strategies

CHISQ	DF	PVALUE	CFI	TLI	RMSEA	NNFI	GFI	WRMR
304.807	366.000	0.991	1.000	1.002	0.000	1.002	0.993	0.764

LHS	OP	RHS	EST	SE	Z	PVALUE	CI.LOWER	CI.UPPER
SCP	**~**	**FLEX**	1.67	0.203	8.228	0	1.272	2.067

The study concludes that Supply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms in Kenya (β= 1.70, p-value < 0.0001, R^2 = 0.736).

H_1: Supply chain risk collaboration strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Supply chain risk collaboration strategies have standardized loading of 1.171 and Z value of 8.596 on performance as shown in Table 4.19. The relation is positive and significant at 1% level as the p-value associated with the critical ratio is less than 0.01. These findings support Wieland and Wallenburg (2012)who found that communicative and collaborative relationships have a positive effect on SC resilience. It is also found that improved resilience, obtained by investing in agility and robustness, enhances a supply chain's customer value. Similary, Srinivasan *et al.* (2011) stated that building trust in relationships contribute to reduction of supply chain related risks. Therefore, Supply chain risk collaboration strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Table 4.19: SC Collaboration Strategies

CHISQ	DF	PVALUE	CFI	TLI	RMSEA	NNFI	GFI	WRMR
310.237	366.000	0.984	1.000	1.002	0.000	1.002	0.993	0.771

LHS	OP	RHS	EST	SE	Z	PVALUE	CI.LOWER	CI.UPPER
SCP	~	COLL	1.71	0.199	8.596	0	1.32	2.1

The study concludes that supply chain risk collaboration strategies have positive influence on performance of food and beverage manufacturing firms in Kenya ($\beta = 1.71$, p-value < 0.0001, $R^2 = 0.745$

H_1: Supply base risk rationalisation strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Supply chain risk rationalisation strategies have standardized loading of 1.727 and Z value o 8.49 with performance as shown in Table 4.20. The relation is positive and significant at 1% level as the p-value associated with the critical ratio is less than 0.01.These findings are in line with those of Ponomarov(2012) that supplier rationalisation based on quality, pricing, delivery and performance of product have significant relationship with four elements of customer satisfaction -product quality, product variety, delivery service and competitive pricing- and firm performance.Musa and Tang (2012) also stated that supplier base rationalizationnarrow the domain and severity of risk to which an exchange is exposed, and thereby encourage cooperation and trust Therefore, Supply chain risk rationalisation strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Table 4.20: SBR Strategies

CHISQ	DF	PVALUE	CFI	TLI	RMSEA	NNFI	GFI	WRMR
315.870	366.000	0.973	1.000	1.002	0.000	1.002	0.992	0.778

LHS	OP	RHS	EST	SE	Z	PVALUE	CI.LOWER	CI.UPPER
SCP	**~**	**SBR**	1.727	0.203	8.49	0	1.328	2.126

The study concludes that supply base risk rationalisation strategies have positive influence on performance of food and beverage manufacturing firms in Kenya ($\beta = 1.73$, p-value < 0.001, $R^2 = 0.749$)

H_1: Supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firms.

Supply chain risk control strategies have standardized loading of 1.777 and Z value of 7.551 with performance as shown in Table 4.21. The relation is positive and significant at 1% level as the p-value associated with the critical ratio is less than 0.001.The research findings agree with Lockamy (2014) findings that companies have been implementing different strategies and philosophies to control inventory, to eliminate waste, bring continuous improvement, to improve forecasting and improved efficiency and responsiveness. Therefore, Supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Table 4.1: SC Control Strategies

CHISQ	DF	PVALUE	CFI	TLI	RMSEA	NNFI	GFI	WRMR
310.244	66.000	0.984	1.000	1.002	0.000	1.002	0.993	0.771

LHS	OP	RHS	EST	SE	Z	PVALUE	CI.LOWER	CI.UPPER
SCP	~	CS	1.777	0.235	7.551	0	1.316	2.239

The study concludes that supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firms ($\beta = 1.78$, p-value < 0.0001, $R^2 = 0.76$)

H_1: Supply chain risk avoidance strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Supply chain risk avoidance strategies have standardized loading of 1.768 and Z value of 7.812 on performance as illustrated in Table 4.22. The relation is positive and significant at 1% level as the p-value associated with the critical ratio is less than 0.01. The study findings tally with those of Christopher and Holweg (2011) who found out thatsupply chains operating in all types of environments attempt to avoid risks within the constraints of acceptable returns such as revenue and profit targets. Hence avoidance strategies lead to better SC performance. Therefore, Supply chain risk avoidance strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Table 4.22: SC Avoidance Strategies

CHISQ	DF	PVALUE	CFI	TLI	RMSEA	NNFI	GFI	WRMR
312.253	366.000	0.981	1.000	1.002	0.000	1.002	0.992	0.773

LHS	OP	RHS	EST	SE	Z	PVALUE	CI.LOWER	CI.UPPER
SCP	~	AS	1.768	0.226	7.812	0	1.324	2.212

The study concludes that supply chain risk avoidance strategies have positive influence on performance of food and beverage manufacturing firms in Kenya ($\beta = 1.77$, p-value < 0.0001, $R^2 = 0.758$).

Table 4.23: Summary of Hypotheses Testing Results

Hypothesis	Path diagram relation	Standardised factor loading (Standard Error)	Z Value	Comment
H1: Supply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms in Kenya	Flexibility → Performance	1.67 (0.203)	8.228**	Hypothesis proved
H2: Supply chain risk collaboration strategies have positive influence on performance of food and beverage manufacturing firms in Kenya	Collaboration → Performance	1.71 (0.199)	8.596**	Hypothesis proved
H3: Supply base risk rationalisation strategies have positive influence on performance of food and beverage manufacturing firms in Kenya	Rationalisation→ Performance	1.727 (0.203)	8.49**	Hypothesis proved
H4: Supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firms	Control → Performance	1.777 (0.235)	7.551**	Hypothesis proved
H5: Supply chain risk avoidance strategies have positive influence on performance of food and beverage manufacturing firms in Kenya	Avoidance → Performance	1.77 (0.226)	7.812**	Hypothesis proved

**Significant at 1% level of significance level

4.10 The Optimal Model

Based on the outcomes of the structural equation modelling (SEM) as shown in Table 4.23, Figure 4.2 is the optimal model for the study. All the variables were found to be valid; none of them was rendered redundant. There was no need for revision as the hypotheses were tested and all the variables statistically established to be relevant. The optimal model is represented in Figure 4.2.

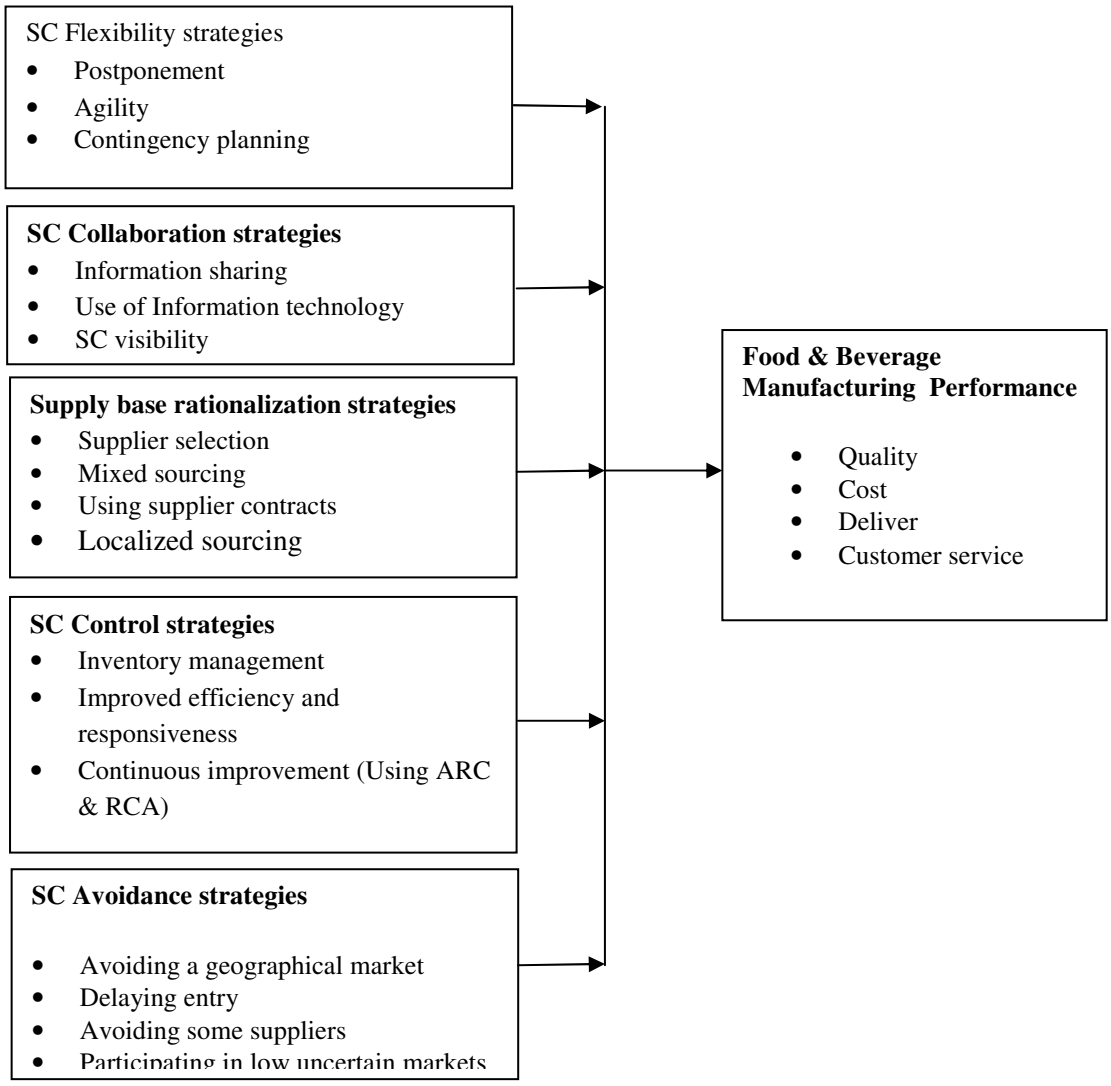

Figure 4.2: Optimal Model

CHAPTER FIVE

SUMMARY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of findings, conclusions and recommendation from the study. The major findings are based on the objectives: to examine the influence of supply chain risk flexibility strategy on performance of food and beverage manufacturing firms in Kenya; to assess the influence of supply chain risk collaboration strategy on performance of food and beverage manufacturing firms in Kenya*;* to explore the influence of supply base rationalisation risk strategy on performance of food and beverage manufacturing firms in Kenya*;* to find out the influence of supply chain risk control strategy on performance of food and beverage manufacturing firms in Kenya;to examine the influence of supply chain risk avoidance strategies on performance of food and beverage manufacturing firms.

5.2 Summary of the Major Findings

The study established that supply chain risk management strategies influence the performance of food and beverage manufacturing firms in Kenya.

5.2.1 Influence of Supply Chain Risk Flexibility Strategies on Performance of F &B Manufacturing Firms in Kenya

The first finding of this study is based on ccontingency theory that suggests that a series of optimal decisions within a firm are contingent (dependent) upon internal and external factors and that the fit between organizational structure and process will lead to better performance.The research findings established that Supply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms in Kenya. Supply chain risk flexibility strategies have standardised loading of 1.67 on performance. The relation is positive and significant at 1% level as the p-value

associated with the Z value (8.228) is less than 0.01. Therefore, Supply chain risk flexibility strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

Flexibility with its dimensions of postponement, agility**,** contingency planning positively impacts its ability to enhance better SC performance. A manufacturing firm can have the flexibility to select different suppliers (mean=3.6),store materials at appropriate locations (mean=3.56), re-arrange production processes for customization (mean=3.42),accommodate customer requirements, delaying processes until customer orders are received and delaying final assembly activities (mean 3.42). Flexibility is a robuststrategy that leads the food & beverage manufacturing firms' efficiency and supply resilience. The strategy enables food and beverage manufacturers to better manage risks, lower SC costs, improve quality, quicken delivery and increase customer service levels. The findings complement the study by Kihyun (2011).

5.2.2 Influence of Supply Chain Risk Collaboration Strategies on performance of F& B Manufacturing Firms in Kenya

The second major implication of this research relates to the relational view. The study found out that Supply chain risk collaboration strategies have positive influence on performance of food and beverage manufacturing firms in Kenya. Supply chain risk collaboration strategies have standardized loading of 1.71 on performance. The relation is positive and significant at 1% level as the p-value associated with the Z value (8.595) is less than 0.01. Therefore, Supply chain risk collaboration strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

The main pillars of a collaborative relationship are information sharing, information technology**,** SC visibility. According to findings, firms need to develop routines and practices that lead to collaboration among partners. Effective information sharing through the use of information technology among partners (mean=3.65) is a key determinant in reducing internal and external risk in the supply chain environment.

Timely and frequent information along with SC partner involvement are also important strategies (mean=3.64).The reduction of these risks leads to improved quality, lowered SC costs, faster delivery and increased customer service levels. This is in line with Breuer *et al.,* (2013) who found a positive relationship between supply chain collaboration and performance.

5.2.3 Influence of Supply Base Rationalisation Risk Strategies on Performance of F&B Manufacturing Firms in Kenya

Based on network theory, the study established that supply base rationalisation risk strategies have positive influence on performance of food and beverage manufacturing firms in Kenya. Supply base rationalisation risk strategies have standardized loading of 1.727 on performance. The relation is positive and significant at 1% level as the p-value associated with the Z value (8.49) is less than 0.01. Therefore, Supply chain risk rationalisation strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

The focus of F& B manufacturing firms has been on developing long-term, trust-based relationships between the supply chain members. The supplier base rationalisation practices such as inspections to qualify suppliers and supplier selection (mean=3.55), mixed sourcing (3.56)**,** using supplier contracts**,** localized sourcing (mean=3.56) an extended usage of flexible contract agreements with multiple suppliers (mean=3.66)were shown to reduce supply chain risks and to influence supply chain performance in terms of costs, delivery, quality and customer service levels. According to Blackhurst *et al*. (2011) supplier rationalization influence SC performance.

5.2.4 Influence of Supply Chain Risk Control Strategies on Performance of F& B Manufacturing Firms in Kenya

The study established that supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firms. Supply chain risk control

strategies have standardized loading of 1.777 on performance. The relation is positive and significant at 1% level as the p-value associated with the Z value (7.551) is less than 0.01. Therefore, Supply chain risk control strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

The ability to learn from past disruptions to develop better preparedness for future events is important to supply chain risk management.It has been viewed that F& B manufacturing firms have been implementing different strategies and philosophies to control inventory (mean=3.45), to eliminate waste, bring continuous improvement, to improve forecasting (mean=3.45) and regular monitoring of supply chains (mean=3.38). These practices impact on operational costs, quality, delivery and customer service levels

5.2.5 Influence of Supply Chain Risk Avoidance Strategies on Performance of F&B Manufacturing Firms in Kenya

The study found out that supply chain risk avoidance strategies have positive influence on performance of food and beverage manufacturing firms in Kenya. Supply chain risk avoidance strategies have a standardized loading of 1.77 on performance. The relation is positive and significant at 1% level as the p-value associated with the Z value (7.812) is less than 0.01. Therefore, Supply chain risk avoidance strategies have positive influence on performance of food and beverage manufacturing firms in Kenya.

From the statistics, F&B manufacturing firms voidance strategies take the form of avoiding a geographical market (3.50)**,** delaying entry (mean=3.58)**,** avoiding some suppliers (mean=3.45) undertaking process and quality audits (mean=3.50) and using information technology (mean=5.86). This type of strategy is geared toward driving overall probabilities associated with risk events of a decision to zero by ensuring that the risk does not exist. In avoiding risks, managers are aware of the supply chain risks and choose to avoid or drop some of these risks thus SC risk avoidance strategies influence

customer service levels, operational costs and quality. This finding is line with Manuj and Mentzer (2008).

5.3 Conclusion

The general objective of the study was to evaluate influence of supply chain risk management strategies on performance of F&B manufacturing in Kenya. From the findings of the path analysis, this study concludes that the most important SCRM strategies on the performance of a F& B manufacturing firm are the SC avoidance strategies. The second most influential SCRM strategies on the performance of a F&B manufacturing firm are SC control strategies followed by SC flexibility strategies and SC base rationalisation strategies respectively. Supply chain collaboration strategies have the least influence on F&B manufacturing firms.

In conclusion, in a changing and challenging environment, food and beverage manufacturers must advance their supply chains beyond the traditional. Without a strategic focus on supply-chain risk management, SC operations can rapidly deteriorate, putting quality, profitability, and lives in danger. From a managerial standpoint, it becomes important to understand and actively manage all the supply chain disruptions that influence business performance and continuity of organizations. Firms need to realize the importance of their SC resilience capabilities that are crucial during the supply chain disruptions. The implementation of supply chain risk management strategies such as avoidance, control, flexibility, supply base rationalization and collaboration is necessary to ensure the continuity of businesses.

5.4 Recommendations

Based on the research findings, the study recommends the following;

5.4.1 SC Flexibility Strategies

It is also necessary for food and beverage manufacturing firms in Kenya to develop capabilities to adapt their supply chains in order to cope with business dynamics such as changes in key markets, technological shifts, and socio-political changes. Flexibility is often characterized as agility, contingency planning and innovativeness. Specifically, a manufacturing firm can have the flexibility to select different suppliers, store materials at appropriate locations, re-arrange production processes for customization, accommodate customer requirements, delay processes until customer orders are received and delay final assembly activities. These characteristics enhance the ability of the firm to respond to SC risks effectively, minimizing the negative impacts on overall supply chain performance levels.

5.4.2 SC Collaboration Strategies

Supply chain risk management strategies have a great relevance for food and beverage manufacturing firms. From the practical point of view, the study recommends that food and beverage manufacturing firms implement collaborative relationships with the suppliers to reduce and prevent the occurrence of supply chain risks. Examining the manufacturing firm's strategies reveals that many of them are trying to optimize their partnerships with the different trading partners so as to improve the operation of supply chains, and ultimately increase customers' satisfaction. The desire to cooperate naturally leads to better supply chain coordination. The basic idea behind the collaboration is that it is not possible for a company to compete in this competitive market successfully by itself. Firms implementing such programs successfully are applying them throughout the company to improve quality and reduce waste. As a result, many organizations are reducing costs, increasing profits and/or revenues, and meeting customer expectations.

Collaborative relationships require trust and information sharing between firms for a long-term period along with commitment to share risk and joint investment. This strategy will in turn support the improvement of flexibility and therefore improved supply chain performance.

5.4.3 SC Supply Base Rationalisation

The study recommends that food and beverage manufacturing firms in Kenya should have a clearly defined sourcing strategy which will significantly improve both the quality and the speed required to achieve a firm's objectives. Strategic Sourcing is the process of evaluating, selecting and aligning with suppliers to achieve SC improvements in line with a firm's strategy. A portfolio analysis technique (Kraljic) which analyses the supply base according to supplier risk factors: risk relates to exposure to supply failure and supply market complexity should be used to as a proactive supply chain risk management process.

5.4.4 SC Control Strategies

In order to improve SC performance, firms must be learning organizations. Continuous analysis and improvement of SC, accurate demand forecasting, quality control, implementing standard operating procedures and implementing changes lead to SC performance. Failure to monitor, control and respond to new challenges can pose devastating risks for food and beverage manufacturing supply chains. Control strategies aim at testing capacity, reducing time to accomplish a process, increasing awareness and knowledge among employees about the risk-management plan and incorporating lessons learned from previous tests and actual incidents. Ideally, F&B manufacturing firms should have detailed governance procedures for managing SC risks.

5.4.5 SC Avoidance Strategies

The results of this study suggest that avoidance strategies such as delaying entry to uncertain markets, total avoidance of such markets are vital to manufacturer's SC competence. Additionally, firms cannot escape supply chain risks, but combining the right capabilities with effective avoidance strategy may lead to successful SC.

5.5 Suggested Areas for Further Study

This study raises several issues that could be of interest to researchers. This study was confined to food and beverage manufacturing firms in Kenya. Future researchers may consider carrying out similar studies in different countries as well as different sectors such as automobile, electronic, textile and service industry. These sectors are sensitive to costs, time, turbulence and competitiveness. Investigating for differences among SC resilience, organizational capability and business performance within and across organizations and across cultures would offer exciting research. Studies may also be carried out to establish the capabilities and tailored strategies necessary for building supply chain resilience in businesses and their impact on financial performance. Researchers could also establish the role of risk awareness culture, organizational structure (centralized and decentralized, standardized and customization SC) on organizational performance. Organizational culture and structure are important drivers of SC resilience and robustness.

REFERENCES

Arshinder, K., & Deshmukh, S. (2007). Supply chain coordination issues: An SAP-LAP frame work. *Asia Pacific Journal of Marketing and Logistics*, *19*(3), 240-264.

Arvis, J., Mustra, M., Panzer, J., Ojala, L.& Naula T. (2007). *Connecting to compete: Trade logistics in the global economy*. Geneva:The World Bank.

Barney, J.B. (2007).*Gaining and sustaining competitive advantage*. Upper Saddle River, NJ: Prentice-Hall.

Barabasi, A. (2009). Scale-free networks: A decade and beyond. *Science,325*(5939),412-413.

Barreto, I. (2010). Dynamic capabilities: A review of past research and an agenda for the future. *Journal of Management*, *36* (1), 256- 280.

Barrett, P. (2007). Structural equation modelling: Adjudging model fit. *Personality and Individual Differences*, *42*(5), 815-824.

Benjamin, T. H., Robert, E. O. & Christopher, A. B. (2015). Suggested reporting guidelines for structural equation modeling in supply chain management research. *The International Journal of Logistics*, Management, *26*(3), 627 – 641.

Bernardes, E., & Hanna, M. (2009). A theoretical review of flexibility, agility and responsiveness in the operations management literature: Toward a conceptual definition of customer responsiveness, *International Journal of Operations & Production Management, 29*(1), 30-53.

Bessant, D. (2008). Mitigating supply chain risks; companies can take simple steps to reduce interruptions into supply chains during natural disasters. *China Business Review, 35*(5), 26 – 29.

Bigliardi, B., & Bottani, E. (2014). Supply chain performance measurement: A literature review and pilot study among Italian manufacturing companies. *International Journal of Engineering, Science and Technology,6*(3), 1-16.

Blackhurst, J., Dunn, K., & Craighead, C. (2011). An empirically derived framework of global supply resiliency.*Journal of Business Logistics,32*(4), 374-391.

Blackhurst, J., Scheibe, K., & Johnson, D. (2008). Supplier risk assessment and monitoring for the automotive industry. *International Journal of Physical Distribution & Logistics Management*, *38*(2), 143-65.

Blos, M., Quaddus, M., Wee, H. & Watanabe, K. (2009). Supply chain risk management: A case study of automotiveand electronic industries in Brazil.*Supply Chain Management: An International Journal*, *14*(4), 247-52.

Breuer, C., Siestrup, G., Haasis, H., & Wildebrand, H. (2013). Collaborative risk management in sensitive logistics nodes. *Team Performance Management,19*(7/8), 331-351.

Bogataj, D., & Bogataj, M. (2007). Measuring the supply chain risk and vulnerability in frequency space. *International Journal of Production Economics*, *108*(1-2), 291-301.

Bullmore, E., & Sporns, O. (2009). Complex brain networks: Graph theoretical analysis of structural and functional systems. *Nature Reviews Neuroscience*, *10*, 186-98.

Buttermann, G., Germain, R., & Lyer, N. (2008). Contingency theory 'fit'as gestalt: An application to supply chain management. *Logistics and Transportation Review*, *44*(6), 955-969.

Carter, C., & Rogers, D. (2008). A framework of sustainable supply chain management: Moving toward new theory. *International Journal of Physical Distribution andLogistics Management, 38*(5), 360-387.

Cantor, E., Blackhurst, J., Pan, M., & Crum, M. (2014). Examining the role of stakeholder pressure and knowledge management on supply chain risk and demand responsiveness. *The International Journal of Logistics Management*, *25*(1), 202-223.

Chan, H., & Chan, F. (2010). Comparative study of adaptability and flexibility in distributed manufacturing supply chains. *Decision Support Systems*, *48*(2), 331–341.

Charles, A., Lauras, M., & Wassenhove, L. (2010). A model to define and assess the agility of supply chains: Building on humanitarian experience, *International Journal of Physical Distribution and Logistics Management*, *40*(8/9), 722-41.

Chen, J., Sohal, S., & Prajogo, D. (2013). Supply chain operational risk mitigation: A collaborative approach. *InternationalJournal of Production Research*, *51*(7), 2186–2199.

Chen, L., & Kang, F. (2007). Integrated vendor-buyer cooperative inventory models with variant permissible delay in payments. *European Journal of Operational Research*, *183*(2), 658-673.

Choi, K., Narasimhan, R., & Kim, S.W. (2012). Postponement strategy for international transfer of products in a global supply chain: A system dynamics examination. *Journal of Operations Management*, *30*(3), 167–179.

Choi, Y. & Krause R. (2006). The supply base and its complexity: Implications for transaction costs, risks, responsiveness, and innovation. *Journal of Operations Management, 24*(5), 637–652.

Chopra, S., Meindl, P., & Kalra, V. (2007). *Supply chain management: strategy, planning and operatio*n. New Delhi: Dorling Kindersley.

Christopher, M. & Holweg, M. (2011). Supply chain 2.0: Managing supply chains in the era of turbulence, *International Journal of Physical Distribution & Logistics Management*, *41*(1), 63-82.

Christopher, M., & Lee, M. (2005). Mitigating supply chain risk through improved confidence. *International Journal of Physical Distribution*, *34*(5), 388.

Christopher, M., Mena, C., Khan, O. & Yurt, O. (2012).Approaches to managing global sourcing risk. *Supply Chain Management: An InternationalJournal*,16(2), 67–81.

Christopher, M., Peck, H. & Towill, D. (2006). A taxonomy for selecting global supply chain strategies. *The International Journal of Logistics Management, 17*(2), 277-287.

Christopher, M. (2005). *Logistics and supply chain managemen*t: Creating value – added networks. Harlow: Prentice Hall.

Clulow, V., Barry, C., & Gerstman, J. (2007). The resource-based view and value: The customer-based view of the firm. *Journal of European Industrial Training*, *31*(1), 19-35.

Coleman, L. (2006). Frequency of man-made disasters in the 20th century. *Journal of Contingencies and CrisisManagement,14*(1), 3-11.

Collicchia, C., Dallari, F., & Melacini, M. (2010). Increasing supply chain resilience in a global sourcing context: Production planning and control. *The Management of Operations, 21*(7), 680–694.

Council for International Development Cooperation (2014). *Kenya labour market profile*. Retrived from www.ulandsskretariatet.dk.

Craighead, C., Blackhurst, J., Rungtusanatham, M. &Handfield, R. (2007). The severity of supply chain disruptions: Design characteristics and mitigation capabilities. *Decision Sciences, 38*(1), 131-156.

Cranfield University (2011). *Creating Resilient Supply Chains: A Practical Guide*. Retrieved on July 19, 2014 from www.cranfield.ac.uk/som/scr

Dekker, H. C., Sakaguchi, J., & Kawai, T. (2013). Beyond the contract: Managing risk in supply chain relations. *Management Accounting Research*, *24*(2), 122–139.

Deming, W.E. (1986). *Out of the crisis*. Boston, MA: MIT Press.

Dyer, J. and Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage, *Academy of Management Review*, *23,* 660-679.

Easterby-Smith, M., Thorpe, R., & Jackson, P. (2008). *Management research* (3rd ed.). London: SAGE Publications Ltd.

Elangovan, D., Sundararaj, G., Devadasan, S., &Karuppuswamy, P. (2010). Development of futuristic supply chain risk management pilot strategies for achieving loss reduction in manufacturing organizations. *World*

Journal of Entrepreneurship, Management and Sustainable Development, 6(1), 39 –51.

Ellegaard, C. (2008). Supply risk management in a small company perspective, *Supply Chain Management: An International Journa*l, *13*(6), 425-34.

Eriksson, P., & Kovalainen, A. (2008).*Qualitative methods in business research*, (1st ed.). London: SAGE Publications Ltd.

Faisal, M., Banwet, D., & Shankar, R. (2007). Information risks management in supply chains: An assessment and mitigation framework. *Journal of Enterprise Information Management, 20*(6), 677-699.

Fawcett, S., Ogden, J., Magnan, G., & Cooper, M. (2006). Organizational commitment and governance for supply chain success. *International Journal of Physical Distribution and Logistics Management*, *36*(1), 22-35.

Flynn, B., Huo, B., & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management*, *28*(1), 58-71.

Ghadge, A., Dani, S., Chester, M., & Kalawsky, R. (2013). A systems approach for modeling supply chain risks. *Supply Chain Management: An International Journal*, 18(5), 523– 538.

Giunipero, L.C., & Eltantawy, R. (2004). Securing the upstream supply chain: A risk management approach, *International Journal of Physical Distribution & Logistics Management*, *34*(9), 698-713.

Gligor, D., & Holcomb, M. (2012). Understanding the role of logistics capabilities in achieving supply chain agility: A systematic literature review. *Supply Chain Management: An International Journal*, *17*(4), 438-453.

Goldratt, M. (1984).*The goal: A process of ongoing improvement,* New York: North River Press.

Grötsch,V., Blome, C., & Schleper, M.C. (2013). Antecedents of proactive supply chain risk management; a contingency theory perspective. *International Journal of Production Research*, *51*(10), 2842-2867.

Gunasekaran, A., Lai, K., & Cheng, T. (2008). Responsive supply chain: A competitive strategy in a networked economy. *Omega, 36*(4), 549-564.

Hair, J., Black, W., Babin, B., & Anderson, R. (2010). *Multivariate data analysis* (7th ed.): Prentice-Hall, Inc. Upper Saddle River, NJ, USA.

Hair, J.F., Hult, G.T.M., Ringle, C.M. & Sarstedt, M. (2013). *A primer on partial least squares structural equation modeling (PLS-SEM),* Thousand Oaks, CA: Sage.

Harland, C., Knight, J., Lamming, K.,& Walker, H. (2005). Outsourcing: Assessing the risks and benefits for organisations, sectors and nations. *International Journal of Operations and Production Management, 25***,** 831-850.

Hearnshaw, E., & Wilson, M. (2011). A complex network approach to supply chain network theory. *International Journal of Operations & Production Management*, 33(4), 442-469.

Hendricks, K., & Singhal, V. (2005). An empirical analysis of the effect of supply chain disruptions on long-run stock price performance and equity risk of the firm*, Production and Operations Management, 14*(1), 35-52.

Hepenstal, A., & Boon, K. (2007). Maturation of business continuity practice in the Intel supply Chain.*Intel Technology Journal*, 11(2),165-171. Retrieved from:

http://www.intel.com/technology/itj/2007/v11i2/8-business-continuity/1-abstract.htm.

Hinterhuber, A. (2013). Can competitive advantage bepredicted? Towards a predictive definition of competitive advantage in the resource-based view of the firm. *Management Decision*, *51*(4), 795-812.

Hofmann, H., Busse, C., Bode, C., & Henke, M. (2013). Sustainability-related supply chain risks: Conceptualization and management. *Business Strategy and the Environment, 23*(3), 160–172.

Hsu, C., Kannan, V., Leong, G., & Tan, K. (2006). Supplier selection construct: Instrument development and validation. *The International Journal of Logistics Management, 17*(2), 213-39.

International Finance Cooperation. (2006). Small and medium enterprise department, background note on micro, small and medium enterprise database, *World Bank,* Washington. Retrieved from www.**ifc**.org/wps/wcm/connect/.../**ifc**.../**ifc**.../smetoolkit- global.

Johnson, B., & Christensen, L. (2010). *Educational Research: Quantitative,Qualitative, and Mixed Approaches*. UK: SAGE.

Jugdev, K., &Mathur, G. (2013). Bridging situated learning theory to the resource-based view of project management. *International Journal of Managing Projects in Business*, *6*(4), 633- 653.

Jüttner, U., &Maklan, S. (2011). Supply chain resilience in theglobal financial crisis: An empirical study. *Supply Chain Management: An International Journal*, *16*(4), 246.

Khan, O., & Burnes, B. (2007). Risk and supply chain management: Creating a research agenda, *International Journal of Logistics Management*, *18*(2), 197-216.

Khan, O., Christopher, M., & Burnes, B. (2008). The impact of product design on supply chain risk: A case study. *International Journal of Physical Distribution and Logistics Management, 38*(5), 412-432.

Kenya Association of Manufacturers (KAM). (2015). *Kenya Association of Manufacturers and Exporters Directory 2015.*Nairobi: Kenya Association of Manufacturers.

Kern, D., Moser, R., Hartmann, E., & Moder, M. (2012). Supply risk management: Model development and empirical Analysis. *International Journal of Physical Distribution and Logistics Management, 42*(1), 60 – 82.

Kihyun, P. (2011). *Flexible and redundant supply chain practices to build strategic supply chain resilience: Contingent and resource- based perspectives* Unpublished PhD thesis, Toredo: The University of Toledo. Retrieved From:utdr.utoledo.edu/cgi/viewcontent.cgi?article=1689&context...dissertations.

Eindorfer, P., & Saad, G.H. (2005). Managing disruption risks in supply chains. *Production and Operations Management*, *14*(1), 53-68.

Kline, R.B. (2011). *Principles and practice of structural equation modeling*, New York, NY.: The Guilford Press.

Kombo, K., & Dello, A. (2006). *Proposal and thesis: an Introduction*. Nairobi: Paulines Publication Africa.

Koskinen, K. (2012). Organizational learning in project based companies: A process thinking approach. *Project Management Journal, 43*(3) 40-49.

Kothari, C. (2008). *Research Methodology: Methods and Techniques (*2nd ed.).New Delhi: New Age International Publishers.

Kouvelis, P., Chambers, C., & Wang, H. (2006). Supply chain management research and production and operations management: review, trends, and opportunities. *Production and Operations Management*, *15*(3), 449-69.

Lance, C. E., Butts, M. M., & Michels, L. C. (2006). The sources of four commonly reported cutoff criteria what did they really say? *Organizational Research Methods*, 9(2), 202-220.

Liao, Y., Hong, P., & Rao, S. (2010). Supply management, supply flexibility and performance outcomes: An empirical investigation of manufacturing firms. *Journal of Supply Chain Management*, *46*(3), 6–22.

Li, G., Lin, Y., Wang, S., & Yan, H. (2006). Enhancing agility by timely sharing of supply information. *Supply Chain Management: An International Journal*, *11*(5), 425-435.

Li, X. & Barnes, I. (2008). Proactive supply risk management methods for building a robust supply selection process when sourcing from emerging markets. *Strategic Outsourcing: An International Journal*, *1*(3), 252-267.

Liu, S., Lin, J., & Hayes, K. (2010). An agile and diversified supply chain: Reducing operational risks. *Competitiveness Review: An International Business Journal*, *20*(3), 222-234.

Lockamy, A. (2014). Assessing disaster risks in supply chains. *Industrial Management and Data Systems,114*(5) 755-777.

Ma, Y., Chen, L., Meng, S., & Cong-qin Yi, C. (2014). A study on the risk control of supply chain under the background of globalization.*Journal of Industrial and Production Engineering*, 31(4), 221-228.

Manuj, I., & Mentzer, J. (2008). Global supply chain risk management strategies. *International Journal of PhysicalDistribution & Logistics Management*, 38(3), 192-223.

Manuj, I., & Mentzer, J. (2008b). Global supply chain risk management strategies. *International Journal of Physical Distribution and Logistics Management*, *38*(3), 192-223.

Manuj, I. (2013). Risk management in global sourcing. *Transportation Journal*, *52*(1), 80–107.

Marley, K. A., Ward, P., & Hill, A. (2014). Mitigating supply chain disruptions – a normal accident perspective. *Supply Chain Management: An International Journal*, *19*(2), 142–152.

Matook, S., Lasch, R., & Tamaschke, R. (2009). Supplier development with benchmarking as part of a comprehensive supplier risk management framework. *International Journal of Operations and Production Management*, *29*(3), 241-67.

Mehrjerdi, Y. (2009). Excellent supply chain management. *Assembly Automation Journal*, *29*(1), 52-60.

Mentzer, J.T., Min, S. & Bobbitt, L.M. (2004). Toward a unified theory of logistics. *International Journal of Physical Distribution and Logistics Management*, *34*(8), 606 - 627.

Micheli, G., Cagno, E., & Zorzini, M. (2008). Supply risk management vs supplier selection to manage the supply risk in the EPC supply chain. *Management Research News*, *31*(11), 846.

Mitchell, V., & Nault, B. (2007). Cooperative planning, uncertainty, and managerial control in concurrent design. *Management Science*, *53*(3), 375-89.

Mugenda, O., & Mugenda, G. (2012). *Research methods dictionary*. Nairobi: ARTS Press.

Musa, S., Wei, S., & Tang, O. (2012). *Information flow and mitigation strategy in a supply chain under disruption* (Working paper). Department of Management and Engineering, Linköping University.

Nag, B., Han, C., &Yao, D. (2014). Mapping supply chain strategy: An industry analysis.

Journal of Manufacturing Technology Management, 25(3), 351-370.

Nembhard, H., Shi, L., & Aktan, M. (2005). A real-options-based analysis for supply chain decisions, *IIE Transactions, 37*(10), 945-56.

Newbert, S. (2007). Empirical research on the resource-based view of the firm: An assessment and suggestions for future research, *Strategic Management Journal*, *28*, 121-46.

Ng, K., Cao, N., Zhang, Z., &To, K. (2008). How are supply chains coordinated? An empirical observation in textile-apparel business. *Journal of Fashion Marketing and Management*, *12*(3), 384-97.

Norman, A., & Jansson, U. (2004). Ericsson's proactive risk management approach after a serious sub-supplier accident. *International Journal of Physical Distribution and Logistics Management*, *34*(5), 434–456.

Nunnally, J.C. (1978). *Psychometric Theory* (2nd ed.). New York, NY: McGraw-Hill.

Oke, A., & Gopalakrishnan, M. (2009). Managing disruptions in supply chains: A case study of a retail supply chain. *International Journal of Production Economics*, *118*(1), 168-174.

Paik, S., & Bagchi, P. (2007).Understanding the causes of the bullwhip effect in a supply chain. *International Journal of Retail and Distribution Management*, *35*(4), 308-24.

Papadakis, I. (2006). Financial performance of supply chains after disruptions: An event study. *Supply Chain Management: An International Journal, 11*(1), 25-33.

Peck, H. (2006). Drivers of supply chain vulnerability: An integrated framework, *International Journal of Physical Distribution and Logistics management*, *35*(4), 210-32.

Pochard, S. (2003). Managing risks of supply chain disruptions: Dual sourcing as a real option (Doctoral dissertation). Retrieved from: www.mit.ed/dissertations.

Ponomarov, S. (2012). Antecedents and consequences of supply chain resilience:A dynamic capabilities perspective Unpublished Phd Thesis, Tennessee: University of Tennessee. Retrieved from: http://trace.tennessee.edu/utk_graddiss/1338.

Ponomarov, S., and Holcomb, M.C. (2009). Understanding the concept of supply chain resilience. *The International Journal of Logistics Management*, *20*(1), 124-143.

Power, D. (2006). Adoption of supply chain management-enabling technologies in SMEs: The view from the top vs the view from the middle. *International Journal of Value Chain Management*, *1*(1), 64-93.

Prasad, T., Tata, J., & Guo, X. (2012). Sustaining small businesses in the United States in times of recession: Role of supply chain networks and social capital. *Journal of Advances in Management Research*, *9*(1), 8-28.

Prater, E., (2005). A framework for understanding the interaction of uncertainty and information systems on supply chain. *International Journal of Physical Distribution and Logistics Management*, *35*(1), 524-539.

Punniyamoorthy, M., Thamaraiselvan, N., & Manikandan, L. (2013). Assessment of supply chain risk: Scale development and validation. *Benchmarking: An International Journal*, *20*(1), 79-105.

Rajesh, V. R., & Rao, V. (2015). Selection of risk mitigation strategy in electronic supply chains using grey theory and digraph-matrix approaches. *International Journal of Production Research*, *53*(1), 238-257.

Rao. (2009). Supply chain risks: A review and typology. *International Journal ofLogistics Management*, *20*(1), 97.

Rees, J., & Allen, J. (2008). The state of risk assessment practices in information security: An exploratory investigation, *Journal of Organizational Computing and Electronic Commerce*, *18*(4), 255-77.

Republic of Kenya, (2014). *Economic survey*. Nairobi: Government Printer.

Rhemtulla, M., Brosseau-Liard, P. & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical

SEM estimation methods in non-ideal conditions. *Psychological Methods*, *17,* 354-373.

Ritchie, B., & Brindley, C. (2007).Supply chain risk management and performance: A guiding framework for future development. *International Journal of Operations & Production Management, 27*(3), 303-322.

Roth, A., Tsay, A., Pullman, M. & Gray, J. (2008). Unraveling the food supply chain: strategic insights from China and the 2007 Recalls. *Journal of Supply Chain Management, 44*(1), 22–39.

Samir, D., & Aman, D. (2010). Fragile food supply chains: reacting to risks. *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, *13*(5), 395-410.

Samuel, K., Goury, M., Gunasekaran, A., & Spalanzani, A. (2011). Knowledge management in supply chain: An empirical study from France. *The Journal of Strategic Information Systems*, *20*(3), 283-306.

Sara, M. E. (2013). Supply chain risk management: The lessons learned from the Egyptian revolution 2011.*International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, *16*(6), 482-492.

Sass, D.A., Schmitt, T.A., & Marsh, H.W. (2014) Evaluating model fit with ordered categorical data within a measurement invariance framework: A comparison of estimators. *Structural Equation Modeling*, *21*(2), 167-180.

Saunders, M., Lewis, P., & Thornhill, A., (2009). *Research methods for business students*. (5th ed.) London: Personal Educational Ltd.

Schmitt, A. (2011). Strategies for customer service level protection under multi-echelon supply chain disruption risk. *Transportation Research Part B: Methodological*, *45*(8), 1266-1283.

Schmitt, A. J., &. Singh, M. (2012). A quantitative analysis of disruption risk in a multi-echelon supply chain. *International Journal of Production Economics*, *139*(1), 22–32.

Schoenherr, T., Griffith, D. A. & Chandra, A. (2014). Knowledge management in supply chains: The role of explicit and tacit knowledge. *Journal of Business Logistics, Forthcoming*. Retrieved from: http://ssrn.com/abstract=2420498.

Scholten, K., Scott, P., & Fynes, B. (2014). Mitigation processes – antecedents forbuilding supply chain resilience. *Supply Chain Management: An International Journal*, *19*(2), 211–228.

Sekaran, U. (2006).*Research methods for business*: *A skill building approach,* (4Th Ed.). UK: John Wiley and Sons.

Sense, A. (2008). Conceptions of learning and managing the flow of knowledge in the project based environment. *International Journal of Managing Projects in Business*, *1*(1), 33-48.

Sheffi, Y., & Rice, J., (2005). A supply chain view of the resilient enterprise, *MIT Sloan Management Review, 47*(1), 41-8.

Sheffi, Y. (2005). *The resilient enterprise: Overcoming vulnerability for competitive advantage*. Cambridge, MA: MIT Press.

Sheffi, Y. (2006). Resilience reduces risk. *Logistics Quarterly*, *12*(4), 12-14. Retrieved from: www.logisticsquarterly.com/issues/12-1/LQ_12-1.pdf

Shepherd, C., & Gunter, H. (2006). Measuring supply chain performance: current research and future directions. *International Journal of Productivity and Performance Management, 55*(3/4), 242–258.

Sinha, P., Whitman, L., & Malzahn, D. (2004). Methodology to mitigate supplier risk in an aerospace supply chain. *Supply Chain Management: An International Journal*, *9*(2), 154-168.

Skipper, J., & Hanna, J. (2009). Minimizing supply chain disruption risk through enhanced flexibility. *International Journal of Physical Distribution and Logistics Management*, *39*(5), 404-427.

Sodhi, M. S., & Tang, S. (2012). Strategic approaches for mitigating supply chain risks. In M. S. Sodhi and C. S. Tang (Eds.) *Managing supply chain risk* (95–108). New York: Springer.

Son, Y., & Orchard, K. (2013). Effectiveness of policies for mitigating supply disruptions. *International Journal of Physical Distribution and Logistics Management, 43*(8), 684-706.

Sorensen, L.B. (2005). How risk and uncertainty is used in supply chain management: A literature study, *International Journal of Integrated Supply Management, 1*(4), 387- 409.

Spekman, R., & Davis, E., (2004). Risky business: Expanding the discussion on risk and the extended enterprise, *International Journal of Physical Distribution and Logistics Management*, *34*(5), 414-433.

Srinivasan, M., Mukherjee, D., & Gaur, A. S. (2011). Buyer–supplier partnership quality and supply chain performance: Moderating role of risks, and environmental uncertainty. *European Management Journal, 29*, 260– 271.

Swink, M. (2006). Building collaborative innovation capability. *Research Technology Management*, *49*(2), 37.

Supply Chain Council. (2008). *Supply risk management (SCRM)*. Retrieved from: <http://supply-chain.org/>.

Talluri, S., Kull, T., Yildiz, H., & Yoon, J. (2013). Assessing the efficiency of risk mitigation strategies in supply chains. *Journal of Business Logistics*, *34*(4), 253–269.

Tang, C. (2006). Perspectives in supply chain risk management, *International Journal of Production Economics*, *103*(2), 451-88.

Tang, C., &Tomlin, B. (2009). How much flexibility does it take to mitigate supply chain risks? *International Series in Operation and Management Science*, *124*(2), 155-174.

Tang, O. & Nurmaya, M. S. (2011). Identifying risk issues and research advancements in supply chain risk management. *International Journal of Production Economics*, *124*(1), 109-20.

Tang, C. S., & Zimmerman, J. (2013). Information and communication technology for managing supply chain risks. *Communications of the ACM*, *56*(7), 27–29.

Teece, D. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(8), 1319-1350.

Thakkar, J., Kanda, A., & Deshmukh, G. (2011). Supply chain issues in Indian manufacturing SMEs: Insights from six case studies. *Journal of Manufacturing Technology Management*, 23(5), 634-664.

Thun, J., & Hoenig, D. (2011). An empirical analysis of supply chain risk management in the German automotive industry. *International Journal of Production Economics*, *131*(1), 242-249.

Tomlin, B. (2006). On the value of mitigation and contingency strategies for managing Supply Chain disruption risks. *Management Science, 52*(5), 639-657.

Tomlin, B. (2009). Impact of supply learning when suppliers are unreliable. *Manufacturing and Service Operations Management, 11*(2), 192-209.

Tørhaug, M. (2008). Petroleum supply vulnerability due to terrorism at North sea oil and gas infrastructures. *Protection of Civilian Infrastructure from Acts of Terrorism NATO Security through Science and Series*, 73-84.

Tracey, M. & Tan, C. (2001). Empirical analysis of supplier selection and involment, customer satisfaction, and firm performance. *Supply Chain Management: An International Journal, 6*(4), 174-88.

Tummala, R.,& Schoenherr, T. (2011). Assessing and managing risks using the Supply Chain Risk Management Process *Supply Chain Management: An International Journal*, *16*(6), 474–483.

Tuncel, G., & Alpan, G. (2010). Risk assessment and management for supply chain networks: A case study. *Computers in industry*, *61*(3), 250-259.

Urciuoli, L. (2010). Supply chain security – mitigation measures and a logistics multi-layered framework. *Journal of Transportation Security, 3*(1), 1–28.

Vaaland, T., & Heide, H. (2007). Can the SME survive the supply chain challenges? *Supply Chain Management: An International Journal*, *12*(1), 20–31.

Vilko, J., Ritala, P., & Edelmann, J. (2014). On uncertainty in supply chain risk management. *International Journal of Logistics Management*, *25*(1), 3–19.

Wagner, S., & Bode, C. (2006). An empirical investigation into supply chain vulnerability. *Journal of Purchasing and Supply Management. 12*(6), 301–312.

Wagner, S., Bode, C., & Koziol, P. (2009). Supplier default dependencies: Empirical evidence from the automotive industry. *European Journal of Operational Research*, *199*(1), 150- 161.

Wagner, S., & Bode C. (2008). An empirical examination of supply chain performance along several dimensions of risk. *Journal of Business Logistics*, *29*(1), 307–325.

Wagner, S., & Neshat, N. (2012). A comparison of supply chain vulnerability indices for different categories of firms. *International Journal of Production Research*, *50*(11), 2877-2891.

Wallenburg, C. & Weber, J.(2005). Structural Equation Modelling as a Basis for Theory Development within Logistics and Supply Chain Management Research. In H. Kotzab, S. Seuring, M. Müller and G. Reiner (Eds.), *Research Methodologies in Supply Chain Management*, 171-186.

Waters, D. (2007). *Supply chain risk management: Vulnerability and resilience in logistics.* London: Kogan Page Limited.

WHO. (2014). Toxicological and Health Aspects of Melamine and Cyanuric Acid: Report of a WHO expert meeting. Health Canada, Ottawa. Canada. 1–4 December 2008, Retrieved from: http://www.who.int/foodsafety/ publications/chem/Melamine_report09.pdf

Wieland, A. (2013). Selecting the right supply chain based on risks. *Journal of Manufacturing Technology Management*, *24*(5), 652-668.

Wieland, A. & Wallenburg, C.M. (2012). Dealing with supply chain risks: Linking risk management practices and strategies to performance, *International Journal of Physical Distribution and Logistics Management*, *42*(10), 887-905.

Wong, W.P., & Wong, K.Y. (2008). A review on benchmarking of supply chain performance measures. *Benchmarking: An International Journal*, *15*(1), 25–51.

World Bank. (2014). *The Kenya 2013 enterprise surveys dataset.* Retrieved from www.worldbank.org/bycountries/microdata.

World Health Organisation, (2014).Terrorist threats to food: guidance for establishing and strengthening prevention and response systems. Department of Food Safety, Zoo noses and Food borne Diseases. Geneva: World Health Organization.

Xiao-Feng, S. (2013). Supply chain characteristics and disruption mitigation capability: An empirical investigation in China, *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, *16*(4), 277-295.

Yang, B., & Yang, Y. (2012). Postponement in supply chain risk management: A complexity perspective. *International Journal of Production*, *48*(7), 1901-1912.

Yilmaz-Börekçi, D., Say, A., & Rofcanin, Y.(2014). Measuring supplier resilience in supply networks. *Journal of Change Management*. doi:10.1080/14697017.2014.889737.

Zailani, S., & Rajagopal, P. (2005). Supply chain integration and performance: US versus East Asian Companies. *Supply Chain Management: An International Journal, 10*(5), 379-93.

APPENDICES

Appendix I: Research Questionnaire

SECTION A: BACKGROUND INFORMATION

Name of organization……

Department……

Designation……

Tick the appropriate box

1 (a) Gender Male ☐ Female ☐

1 (b) Years of Experience 1-5 ☐ 6-10 ☐

11-15 ☐ over 15 ☐

1(c) Highest qualification Certificate ☐ Diploma ☐

Bachelor's degree ☐ Master's degree ☐

PhD ☐ Other ☐

Specify……

Categories of Manufacturing Firms

	Please choose the type of your firm	
	Alcoholic beverages and spirits	
	Cocoa, chocolate and sugar confectionaries	
	Dairy products	
	Juices, water and carbonated soft drinks	
	Meat and meat products	
	Vegetable oils.	

SECTION B: SUPPLY CHAIN RISK MANAGEMENT STRATEGIES

1. Flexibility strategies

is the ability to delay the actual commitment of resources and activities to maintain flexibility and delay incurring costs

To what extent do these statements apply to your postponement strategy? (1 – strongly disagree; 2-Diagree; 3-Neutral; 4-Agree; 5- Strongly agree)

	SC Activities	5	4	3	2	1
F1	POSTPONEMENT Delays final product assembly activities until the last possible position (or nearest to customers) in the supply chain					
F2	Stores items at appropriate distribution points close to the customers in the supply					
F3	AGILITY Can re-arrange production processes so that customization can be carried out later					
F4	Delays final product assembly activities until customer orders have actually been received					
F5	Accommodate several customer service requirements					
F6	CONTIGENCY PLANNING Quick reorganize supply chain resources immediately to respond to supply chain risks					
F7	Preparation of a set of action plans for unexpected disruptions					
F8	Sharing of information with supply chain partners with regards to contingency plans					

2. Collaboration strategies: Supply chain relations are based on integration, coordination and collaboration across the supply chain from the customers to the suppliers**.**

To what extent do these statements apply to your supply chain collaboration strategies? (1 – strongly disagree; 2-Diagree; 3-Neutral; 4-Agree; 5- Strongly agree)

	SC activity	**5**	**4**	**3**	**2**	**1**
CO1	INFORMATION SHARING Exchange of information that helps in the reducing supply chain risks					
CO2	Frequent and timely exchange of information about events or changes that may affect business					
CO3	SC VISIBILITY Collaboration with supply chain partners					
CO4	Help suppliers improve quality					
CO5	is informed of the changing trends in business					
CO6	INFORMATION TECHNOLOGY Information technology is used to reduce supply chain risks					
CO7	Involvement of supply chain partners in the new product design, development effort and marketing					

3. Supply base rationalisation strategies: management of suppliers in away that reduces supply chain risks

To what extent do these statements apply to your supply base rationalisation strategy? (1 – strongly disagree; 2-Diagree; 3-Neutral; 4-Agree; 5- Strongly agree)

	Activity	**5**	**4**	**3**	**2**	**1**
SBR1	MIXED SOURCING Sourcing from multiple local suppliers to minimize the likelihood of supply chain risks					
SBR2	Sourcing from multiple foreign suppliers to minimize losses					
SBR3	LOCALISED SOURCING Sourcing from a few local and foreign suppliers					
SBR4	Sourcing from a few local suppliers only to minimize risks					
SBR5	SUPPLIER SELECTION Sourcing from suppliers who have been evaluated and selected to reduce supply risks					
SBR6	Collaborative long term relationship with the suppliers to minimize supply risks					
SBR7	CONTRACTS Contracts with selected suppliers to reduce supply risks					

4. Control strategies: Supply chain risk control is the process of taking proactive steps to reduce the identified risks where possible and putting procedures, rules or policies in place to minimize the residual risk or to reduce the severity of such a loss.

To what extent do these statements apply to your supply chain control strategy? (1 – strongly disagree; 2-Diagree; 3-Neutral; 4-Agree; 5- Strongly agree)

	SC activity	**5**	**4**	**3**	**2**	**1**
CS1	INVENTORY MAGT Holding of buffer stock to mitigate the risk of stock-out					
CS2	Keeping extra inventory of strategic items (e.g., raw materials, parts, and finished goods					
CS3	CAPACITY Holding of underutilized capacity which serves as a cushion to any disruptions					
CS4	Adequate financial resources					
CS5	CONTINUOUS IMPROVEMENT Regular monitoring of supply chain risks (demand, supply, process and environmental risks)					
CS6	Using improved forecasting techniques to reduce risks associated with supply chain					
CS7	Having business continuity plans					
CS8	Centralised decision making					

5 Avoidance strategies: This type of strategy is geared toward driving overall probabilities associated with risk events of a decision to zero by ensuring that the risk does not exist.

To what extent do these statements apply to your supply chain avoidance strategy? (1 – strongly disagree; 2-Diagree; 3-Neutral; 4-Agree; 5- Strongly agree

	Our firm...	**5**	**4**	**3**	**2**	**1**
A1	Avoids geographical markets deemed risky					
A2	Avoids some suppliers in order to minimize supply chain risks					
A3	Delays getting into certain markets until the uncertainty is reduced					
A4	Audits both our processes and supplier processes to minimize quality risks					
A5	Information technology is used to reduce supply chain risks					
A6	Using order policy to determine quality					
A7	Use our own products in manufacturing					

SECTION C: SUPPLY CHAIN PERFORMANCE

A firm's supply chain performance is measured in terms of cost, quality, delivery relative to the industry standards and customer service levels (Adapted from Wong & Wong, 2008)

To what extent do these statements apply to your business operation performance? (1 – strongly disagree; 2-Diagree; 3-Neutral; 4-Agree; 5- Strongly agree

		5	**4**	**3**	**2**	**1**
SCP1	The ability to achieve the lowest possible cost of logistics through efficient operations, technology, and/or scale economies					
SCP2	The ability to reduce the time between order receipt and customer delivery to as close to zero as possible					
SCP3	The ability to meet quoted or anticipated quality and quantities on a consistent basis					
SCP4	The extent to which perceived supply chain performance matches customer expectations					

THANK YOU FOR YOUR TIME.

Appendix 2: Summary of the Origin of Research Variables

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
Flexibility	Kihyun	2011	Flexible and Redundant Supply Chain Practices to Build Strategic Supply Chain Resilience: Contingent and Resource-based Perspectives	Contingent theory Resource based view	survey data was collected from the U.S. and South Korea, analyzed by Structural Equation Modeling using AMOS 6.0	The study provided a theoretical framework for resilient supply chain framework and empirical validation of supply chain risk as well as processes used to manage supply chain risks effectively	Kenya does not have similar political, economic, regulatory, legal and bureaucratic environment. Therefore the need to carry out this study to establish the applicability of the results.

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
	Christopher , *et al.*	2012	Approaches to managing global sourcing risk	Supply chain risk management	Multi case study	Most companies do not have a structured supply chain risk management and mitigation system. The paper proposes four generic strategies for from managing global sourcing risk: network re-engineering, collaboration, agility and a risk management culture.	The research was conducted on the perspective of a buying firm. A large scale study across different industries will therefore improve the validity and generalisability
	Liu, *et al.*	2010	An agile and diversified supply chain: reducing operational risks	Risk management theory	Empirical	An agile and diversified supply chain can be built to cope with the demand or supply uncertainties and in turn reduce the	The study was mainly about the agility of operations in organisations. It is necessary to analyse

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
						operational risks	empirically other strategies of SCRM as argued in different literature.
	Wieland	2013	Selecting the right supply chain based on risks	Unionist perspective	Modelling	The paper proposes that resilience is appropriate in the case of high supply chain risk probability and impact.	The study's main gap was its modelling of large businesses. Hence, our study seeksto fill that gap by studying F&B manufacturing firms.
	Wieland & Wallenburg	2012	Dealing with supply chain risks: Linking risk management practices and strategies to performance	Supply chain theory	Case study Survey data were collected from 270 manufacturing companies	Robustness can be considered a basic prerequisite to deal with supplier-side risks Agility is necessary to deal with customer-side risks. Being	The sample concerned manufacturing firms. There is need to empirical study whether the same can be said of F&B processing firms

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
					Structural equation modelling	agile has a strong positive effect on the supply chain's customer value	
Collaborative strategies	Wieland & Wallenburg	2012	The influence of relational competencies onsupply chain resilience: a relational view	Relational view	Employed a confirmatory approach Survey data collected from manufacturing firms from three countries, which is analyzed using structural equation modeling.	The researchers found that communicative and cooperative relationships have a positive effect on resilience, while integration does not have a significant effect. It is also found that improved resilience, obtained by investing in agility and robustness, enhances a supply chain's customer value.	This research is inadequate in evaluation and dissemination of the supply chain risk management responses and practices being employed in different sectors.
	Vaaland & Heide,	2007	Can the SME survive the supply chain challenges?	SCM theory	A cross-sectional survey of	Planning and control methods are crucial for	This study only deals with the exposure of

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
					200 Norwegian companies with informants mainly related to the SCM function and from top management	enhancing SCM competitiveness through reduction of transaction costs considerably and freeing up the level of locked up capital.	Norwegian SMEs to resilient supply chain management practices. It is important to gain a similar understanding of the impact that these practices on food manufacturing firms in developing countries
	Christopher, M., & Lee, M.	2004	Mitigating supply chain risk through improved confidence	SCRM theory	Conceptual	The researchers argue that to restore supply chain confidence and break the risk spiral, organizations must address the two basic elements of supply chain	The study would be filling the gap by empirically testing the conceptualised relationships

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
						confidence: visibility and control.	
	Scholten, *et al.*	2014	Mitigation processes – antecedents for building supply chain resilience	Collaborative agency perspective	Case study	The development of an integrated supply chain resilience framework capturing the interplay of disastermanagement processes and capabilities required to build supply chain resilience. The critical importance of mitigation processes in building supplychain resilience is highlighted.	The study was limited to collaborative agency theory. Further conceptualizationusing different research perspectives such as learning theory, theory of constraints, and systems theory would be appropriate

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
Supply base strategies	Chris Ellegaard	2008	Supply risk management in a small company perspective	SCRM theory	Qualitative case study	The findings confirm that the small businesses apply largely the same supply risk management practices such as risk elimination practices i.e knowledge protection and local sourcing as the major practices, combined with relational practices i.e fairness, loyalty, and seeking out responsive, dependable, and responsive and dependable suppliers	The study focuses exclusively on small manufacturing companies. Studies of other types of companies might reveal other practices. Therefore the need to carry out this study
	Christopher & Peck	2005	Building the Resilient Supply Chain	SCRM	Conceptual	The study proposed several supply chain risk	Given that the study was conceptual, it

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
						management strategies such as supply chain re-engineering, supply chain collaboration, agility and developing culture of risk management.	needs to be empirically tested and validated.
	Micheli *et al*.	2008	Supply risk management vs supplier selection to manage the supply risk in the EPC supply chain	SRM	Multi case study	The results of the research pointed out that supply risk can be managed through both SSand SRM. These two different approaches are used alternatively by the companies investigated under resource constraints. A further set of practices include	Although the sample of the in-depth research is representative of the Italian EPC sector, its size implies care in drawing a fully generalizable conclusion. Moreover, the research focuses on companies belonging only to the EPC sector.

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
						project orientation in supply management, use of partnerships with suppliers, corporate standardisation and need of co-design.	Hence, this study will seek to study SCRM strategies in F&B companies
	Wagner and Bode	2008	An empirical examination of supply chain performance alongseveral dimensions of risk	Contingency theory	Survey	A firm's dependence on certain customers andsuppliers, the degree of single sourcing, or reliance on global supply sources arerelevant for a firm's exposure to supply chain risk	The data for the survey were collected from firms based in Germany. Therefore, the results hold only true for firms based in countries with a similar political, economic, and geographic setting. It is imperative to examine the influence of SCRM strategies on SC performance

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
	Prasad, *et al.*	2012	Sustaining small businesses in the United States in times of recession: Role of supply chain networks & social capital	Social capital theory	Modeling	Small businesses need to invest in creating structural, relational and social capital prior toa recession in order to protect themselves from the additional uncertainty. Small businesses candevelop social capital relatively easily and inexpensively through their supply chains.	in Kenya It would be informative to survey multiple sources and informants within the participating companies.
Control strategies	Cantor, *et al.*	2014	Examining the role of stakeholder pressure and	Stakeholder theory	The sample for the survey consisted of	The study an important organizational strategy that firms	The main gap is that the study was mainly in the US By studying F&Bs

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
			knowledge management on supply chain risk and demand responsiveness		4456 supply chain management professionals in US manufacturing industries.	can pursue to minimize supply chain risk is to mobilize its KM resources to facilitate improved collaboration with the firm's supply base.	SCRM strategies in a developing country in diverse commercial contexts, our insights are broadened
	Lockamy	2014	Assessing disaster risks in supply chains	Risk management theory	Modeling and survey of 15 companies	Bayesian networks can be effectively used to assist managers in making decisions regarding current and prospective suppliers vis-a` -vis their potential revenue impact as illustrated through their corresponding disaster	The researchers used a narrow range of respondents. A wider range of respondents could make the results more generalizable
	Son& Orchard	2013	Effectiveness of policies for mitigating supply	Inventory management theory	Simulation experiment	The results of the study indicated that the use of	A simulation experiment used in this study may not

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
			disruptions			strategic inventory reserves proves to be a more effective tool for mitigating supply disruption impact than the practice of maintaining larger stocks of cycle inventory	be sufficient to capture collaboration amongst supplychain partners, a critical factor in mitigating supply chain risks
	Giunipero and Eltantawy	2004	Securing the upstream supplychain: a risk managementapproach	Situational risk management	Conceptual	Situational factors such as degree of product technology, security needs, therelative importance of the supplier, and the purchaser's prior experience with the situation should be taken into consideration when determining the level of riskmanagement	Given that the study was conceptual, it needs to be empirically tested and validated. In addition, control strategy is observed in this study, but not much discussed and hence an issue for research.

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
						in the supply chain	
	Blos, *et al.*	2009	Supply chain risk management (SCRM): A case study on the automotive and electronic industries in Brazil	SCRM	Case study of automotive and electronic industries in Brazil	There are significant practices to implement SCRM: better supply chain communication, SCRM and business continuity planning trainingprogram, and the creation of a chief risk officer position to manage the supply chain risks.	The study on SCRM strategies on F&B processing firms would be appropriateto establish the transferability of the single casestudy findings to different organisational contexts
Avoidance strategies	Manuj & Mentzer	2008	Global supply chain risk management strategies	Grounded theory	A comprehensive literature review and a qualitative	The study provided the supply chain risk management strategies which	A cross-country study would be able to provide a better understanding on

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
					study comprising 14 in-depth interviews and a focus group meeting with senior supply chain executives.	include postponement, speculation, hedging, control/share/transfer, security, and avoidance.	how legislative and cultural factors could affect supply chain networks of F&B firms
	Tuncel & Alpan	2010	Risk assessment and management for supply chain networks: A case study		Case study modeling	The findings of the case study shows that the system performance can be improved using risk management actions and the overall system costs can be reduced by mitigation scenarios.	The limitation of the study is lack of richness of characterization of SCRM strategies. Our study will increase the sample size, draw respondents from more diversified geographic areas, and employ greater number of measures of SCRM strategies and performance.
	Ghadge, *et al*.	201	A systems	Systems	Modeling /	The framework	Therisk model is

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
		3	approach for modeling supply chain risks.	approach	experimental	for SCRM provides asystematic process for enhanced risk management. Theprocess also provides a foresight into how risks willpropagate in future periods based on thehistorical data	tested and validated based on single case studyand further studies in food industry will improve therobustness of SCRM.
	Tang & Tomlin,	2008	The power of flexibility for mitigating supply chain risks	SCRM	Modeling	The results showed that the group pursuing preventive supply chain risk management had better values concerning flexibility or safety stocks.	Avoidance strategy is observed in this study, but not much discussed and hence an issue for inquiry in this study.
	Punniyamoorthy	2013	Assessment of supply chain risk: Scale	Risk management theory	A systematic approach is	The framework for prioritization of risk constructs	The study used a few heavy engineering Indian

Variable	Source	Year	Title	Theoretical foundation	Methodology	Findings	Research gap
			development and validation		used to develop risk scale	revealed the importance of various supply chain risk constructs	firms to develop the model. An objective cross cutting study of F&B processing firms is necessary.

Appendix 3: K.A.M Food and Beverages Manufacturing Firms

1. Africa Spirits Ltd
2. Agricultural & Veterinary Supplies Ltd (AGRI-VET)
3. Agriner Agricultural Development
4. Agri Pro-Pak Ltd
5. Agro Chemical and Food Company Ltd
6. Al- Mahra Industries Ltd
7. Alpha Fine Foods Ltd
8. Alphine Coolers Ltd
9. Aquamist Ltd
10. Arkay Industries Ltd
11. Bakers Corner Ltd
12. Bakex Miller Ltd
13. Belat Enterprises
14. Belfast Millers Ltd
15. Beverage Services (K) Ltd
16. Bidco Africa Ltd
17. Bio Food Products Ltd
18. Bounty Ltd
19. The Breakfast Cereal Company (K) Ltd
20. Kenya Ltd Broadway Bakery Ltd
21. Brookside Dairy Ltd
22. Bunda Cakes & Fees Ltd
23. Bunge East Africa Ltd
24. Butali Sugar Mills Ltd
25. Buzeki Dairy Ltd
26. C. Dormans Ltd
27. Cardbury Kenya Ltd
28. Caffe Del Duca Ltd

29. Candy Kenya Ltd
30. Capwell Industries Ltd
31. Centrofood Industries Ltd
32. Chai Trading Company Ltd
33. Chemelil Sugar Company Ltd
34. Chirag Kenya Ltd
35. Coast Silos (K) Ltd
36. Coastal Bottlers Ltd
37. Coca-Cola East & Central Africa Ltd
38. Coffee Agriworks Ltd
39. Cofftea Agencies
40. Danone Baby Nutrition Africa & Overseas
41. Deepa Industries Ltd
42. Tropical Brand (Africa) Ltd
43. Del Monte Kenya Ltd
44. Diamond Industries Ltd
45. Doinyo Lessos Creameries Ltd
46. DPL Festive Ltd
47. Dutch Water Ltd
48. East Africa Breweries Ltd
49. East African Malt Ltd
50. East Africa Sea Food Ltd
51. Edible Oil Products
52. Eldoret Grains Ltd
53. Elekea Ltd
54. Ennvalley Bakery Ltd
55. Equator Bottlers Ltd
56. Erdemann Co. (K) Ltd
57. Europack Industries Ltd
58. Excel Chemicals Ltd

59. Farmers Choice Ltd
60. Fresh Produce Exporters Association of Kenya
61. Frigoken Ltd
62. Giloil Company Ltd
63. Githunguri Dairy Farmers Co-Operative Society
64. Glaciers Products
65. Global Fresh Ltd
66. Global Tea & Commodities (K) Ltd
67. Gold Crown Beverages (K) Ltd
68. Gona Best Ltd
69. Grain Industries Ltd
70. Green Forest Foods Ltd
71. Happy Cow Ltd
72. Heritage Foods Kenya Ltd
73. Highlands Canners Ltd
74. Highlands Mineral Water Company Ltd
75. Insta Products (EPZ) Ltd
76. Jambo Biscuits (K) Ltd
77. James Finlay Kenya Ltd
78. Jetlak Foods Ltd
79. Jjasm Mini-Distillery
80. Juja Coffee Exporters
81. Jungle Group Holdings
82. Kabianga Dairy Ltd
83. Kerio Valley Development Authority
84. Eastern Produce (K) Kakuzi
85. Kambu Distillers Ltd
86. Kamili Packers Ltd
87. Kappa Oil Refineries Ltd
88. Karirana Estate Ltd

89. Kenafric Bakery
90. Kenafric Industries Ltd
91. Kenblest Ltd
92. Kenchic Ltd
93. Kenlab Supplies Ltd
94. Kenstaste Products
95. Kenya Meat Commission
96. Kenya Nut Company Ltd
97. Kenya Sweets Ltd
98. Kenya Tea Development Agency
99. Kenya Tea Growers Association
100. Kenya Tea Packers Ltd (KETEPA)
101. Kenya Wine Agencies Ltd
102. Keroche Industries Ltd
103. Kevian Kenya Ltd
104. Kibos Sugar & Allied Industries
105. Kinagop Dairy Ltd
106. Kisii Bottlers Ltd
107. Koba Waters Ltd
108. Krish Commodieties Ltd
109. Kuguru Food Complex Ltd
110. Kwality Candies & Sweets Ltd
111. London Distillers (K) Ltd
112. Mafuko Industries Ltd
113. Mama Millers Ltd
114. Manji Food Industries Ltd
115. Mayfeeds Kenya Ltd
116. MDI Ltd
117. Melvin Marsh International
118. Menegai Oil Refineries Ltd

119. Milly Fruit Processors
120. Mini Bakeries
121. Miritini Kenya Ltd
122. Mjengo Ltd
123. Mombasa Maize Millers
124. Morani Ltd
125. Mount Kenya Bottlers Ltd
126. Mumias Sugar Company Ltd
127. Mzuri Sweets Ltd
128. Nairobi Bottlers Ltd
129. Nairobi Flour Mills Ltd
130. Nas Airport Services Ltd
131. New Kenya Co-Operative Creameries Ltd
132. Nesfoods Industries Ltd
133. Nestle Foods Kenya Ltd
134. Nicey Nicey Maize Millers
135. Nicola Farms Ltd
136. Njoro Canning Factory (Kenya) Ltd
137. Norda Industries
138. Nutro Manufacturing Epz Ltd
139. Nzoia Sugar Company Ltd
140. Palmhouse Diaries Ltd
141. Patco Industries Ltd
142. Pernod Ricard Kenya Ltd
143. Pearl Industries Ltd
144. Pembe Flour Mills Ltd
145. Premier Flour Mills Ltd
146. Premier Food Industries Ltd
147. Pride Industries Ltd
148. Pristine International Ltd

149. Proctor & Allan (E.A) Ltd
150. Promasidor Kenya Ltd
151. Pwani Oil Products Ltd
152. Rafiki Millers Ltd
153. Raka Milk Processors Ltd
154. Razco Ltd
155. Re-Suns Spices Ltd
156. Rift Valley Bottlers Ltd
157. Salim Wazarani Kenya Company Ltd
158. Sameer Agriculture & Livestock (Kenya) Ltd
159. SBC Kenya Ltd
160. Sigma Supplies Ltd
161. Selecta Kenya Gmbh & Sons KG
162. Spectre International Ltd
163. South Nyanza Sugar Company Ltd
164. Spice World Ltd
165. Sunny Processors Ltd
166. Supa Sweets Ltd
167. Sweet Rus Ltd
168. Trufoods Ltd
169. Trust Feeds Ltd
170. Trust Flour Mills Ltd
171. T.S.S Grain Millers Ltd
172. Umoja Flour Millers Ltd
173. Umoja Maintenance Centre (K) Ltd
174. Unga Group Ltd
175. United Distillers And Vintners
176. United Millers Ltd
177. Usafi Services Ltd
178. Valuepak Food

179. Valley Confectionery Ltd
180. Vinepack Ltd
181. W.E Tilley(Muthaiga) Ltd
182. Wanaishi Marine Products (K) Ltd
183. Wanji Food Industries Ltd
184. West Kenya Sugar Company Ltd
185. Winnie's Pure Health
186. Wrigley Company (E.A.) Ltd
187. Xpressions Flora Ltd

Appendix 4: Summary of Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
AS1	19	1	5	3.63	1.165	-.592	.524	-.176	1.014
AS2	19	1	5	3.68	1.250	-1.043	.524	.488	1.014
AS3	19	1	5	3.79	1.228	-.961	.524	-.007	1.014
AS4	19	2	5	4.05	1.177	-.797	.524	-.947	1.014
AS5	19	2	5	4.05	1.224	-.924	.524	-.793	1.014
AS6	19	1	4	2.05	.970	.701	.524	-.199	1.014
AS7	19	1	4	2.11	1.100	.611	.524	-.870	1.014
COLLABORATION1	19	1	5	3.68	1.157	-.744	.524	.059	1.014
COLLABORATION2	19	1	5	3.68	1.157	-.744	.524	.059	1.014
COLLABORATION3	19	2	5	3.58	1.071	.075	.524	-1.213	1.014
COLLABORATION4	19	2	5	3.84	1.015	-.366	.524	-.912	1.014
COLLABORATION5	19	1	5	3.95	1.311	-1.380	.524	1.046	1.014
COLLABORATION6	19	1	5	2.89	1.100	.508	.524	-.335	1.014
COLLABORATION7	19	1	5	2.37	1.165	.592	.524	-.176	1.014
CS1	19	2	5	3.79	.976	-.333	.524	-.737	1.014
CS2	19	2	5	4.00	1.000	-.745	.524	-.314	1.014
CS3	19	2	5	3.84	1.119	-.455	.524	-1.138	1.014
CS4	19	1	5	3.68	1.293	-.886	.524	.055	1.014
CS5	19	2	5	3.58	1.071	-.229	.524	-1.102	1.014
CS6	19	1	5	2.42	1.346	.645	.524	-.598	1.014
CS7	19	1	5	2.74	1.327	.541	.524	-.739	1.014
CS8	19	1	5	2.58	1.427	.592	.524	-.892	1.014
FLEXIBILITY2	19	2	5	3.68	1.108	-.386	.524	-1.109	1.014
FLEXIBILITY3	19	2	5	3.84	1.068	-.571	.524	-.778	1.014
FLEXIBILITY4	19	3	5	3.89	.809	.204	.524	-1.412	1.014
FLEXIBILITY6	19	1	5	1.84	1.259	1.450	.524	1.066	1.014
FLEXIBILITY8	19	1	3	1.63	.684	.632	.524	-.527	1.014
FLEXIBILTRY5	19	2	5	4.11	1.150	-.962	.524	-.538	1.014
FLEXIBILTY1	19	2	5	3.74	.991	-.172	.524	-.942	1.014
FLEXIBILTY7	19	1	5	2.95	1.224	.110	.524	-.968	1.014
SBR1	19	1	5	3.84	1.259	-.978	.524	-.085	1.014
SBR2	19	1	5	3.58	1.216	-.516	.524	-.598	1.014
SBR3	19	1	5	3.58	1.216	-.930	.524	.387	1.014
SBR4	19	2	5	3.68	1.108	-.386	.524	-1.109	1.014
SBR5	19	2	5	3.68	1.108	-.386	.524	-1.109	1.014
SBR6	19	1	5	2.32	1.157	.744	.524	.059	1.014
SBR7	19	1	5	2.68	1.293	.491	.524	-.926	1.014
SCP1	19	1	5	3.42	1.017	-.646	.524	.485	1.014
SCP2	19	1	5	3.74	1.408	-1.212	.524	.233	1.014
SCP3	19	2	5	3.63	1.065	-.384	.524	-.981	1.014
SCP4	19	1	5	3.89	1.286	-1.358	.524	1.085	1.014
Valid N (listwise)	19								

Appendix 5: Refined Constructs/Variables

Latent Variables	Item Mean	Item SD	Alpha Cronbach
FLEXIBILITY STRATEGIES	**3.44**	**1.24**	**0.808**
Postponement			
F1Delays final product assembly activities until the last possible position (or nearest to customers) in the supply chain			
F2 Stores items at appropriate distribution points close to the customers in the supply			
Agility & CP			
F3 Can re-arrange production processes so that customization can be carried out later			
F4 Delays final product assembly activities until			

customer orders have actually been received			
F5 Accommodate several customer service requirements			
COLLABORATION STRATEGIES	**3.61**	**1.24**	**0.897**
Information sharing			
CO1 Exchange of information that helps in the reducing supply chain risks			
CO2 Frequent and timely exchange of information about events or changes that may affect business			
SC visibility			
CO3 Collaboration with supply chain partners			
CO4 Involvement of supply chain partners in the new product design development effort and marketing			
Information technology			

CO5 Information technology is used to reduce supply chain risks			
SUPPLY BASE RATIONALISATION	**3.55**	**1.22**	**0.880**
Mixed sourcing			
SBR1:Sourcing from multiple local suppliers to minimize the likelihood of supply chain risks			
SBR2 Sourcing from multiple foreign suppliers to minimize losses			
Localised sourcing			
SBR3 Sourcing from a few local and foreign suppliers			
SBR4 Sourcing from a few local suppliers only to minimize risks			
Supplier selection			
SBR5 Sourcing from suppliers who have been			

	evaluated and selected to reduce supply risks			
	CONTROL STRATEGIES	**3.43**	**1.24**	**0.859**
	Inventory management			
	CS1 Holding of buffer stock to mitigate the risk of stock-out			
	CS2 Keeping extra inventory of strategic items (e.g. raw materials parts, and finished goods)			
	Capacity			
	CS3 Holding of underutilized capacity which serves as a cushion to any disruptions			
	Continuous improvement			
	CS4 Using improved forecasting techniques to reduce risks associated with supply chain			
	CS5 Regular monitoring of supply chain risks (demand, supply process and environmental risks			

AVOIDANCE STRATEGIES	**3.58**	**1.28**	**0.881**
A1Avoids geographical markets deemed risky			
A2 Avoids some suppliers in order to minimize supply chain risks			
A3 Delays getting into certain markets until the uncertainty is reduced			
A4 Audits both our processes and supplier processes to minimize quality risks			
A5 Information technology is used to reduce supply chain risks			
DEPENDENT VARIABLE			
SC PERFORMANCE	**3.47**	**1.13**	**0.899**
SCP1 The ability to achieve the lowest possible cost of logistics through efficient operations and/or scale economies			
SCP2 The ability to reduce the time between order			

	receipt and customer delivery to as close to zero as possible
	SCP3 The ability to meet quoted or anticipated quality and quantities on a consistent basis
	SCP4 The extent to which perceived supply chain performance matches customer expectations

Appendix 6: Individual Variable Communalities

	Initial	Extraction
FLEXIBILTY1	1.000	.883
FLEXIBILITY2	1.000	.918
AS6	1.000	.868
AS7	1.000	.882
AS5	1.000	.942
AS2	1.000	.947
AS4	1.000	.932
AS3	1.000	.900
AS1	1.000	.909
CS6	1.000	.793
CS8	1.000	.898
CS7	1.000	.951
CS5	1.000	.947
CS3	1.000	.896
CS4	1.000	.816
SBR7	1.000	.766
CS2	1.000	.946
CS1	1.000	.909
FLEXIBILITY3	1.000	.881
SBR4	1.000	.936
SBR6	1.000	.927
SBR5	1.000	.874
SBR1	1.000	.893
SBR3	1.000	.852
SBR2	1.000	.918
FLEXIBILITY4	1.000	.842
COLLABORATION7	1.000	.773
COLLABORATION6	1.000	.803
COLLABORATION5	1.000	.919
COLLABORATION4	1.000	.968
COLLABORATION3	1.000	.870
COLLABORATION2	1.000	.861
COLLABORATION1	1.000	.892
FLEXIBILITY8	1.000	.884

FLEXIBILTRY5	1.000	.916
SCP2	1.000	.975
SCP4	1.000	.940
SCP3	1.000	.940
FLEXIBILTY7	1.000	.928
SCP1	1.000	.850
FLEXIBILITY6	1.000	.935

Extraction Method: Principal Component Analysis.

Appendix 7: CFA Output- Robust DWLS Estimator

```
>summary(p.m, standardized=TRUE)

lavaan (0.5-20) converged normally after 128 iterations


  Number of observations                           165


  Estimator                                       DWLS      Robust
  Minimum Function Test Statistic              302.919     435.165
  Degrees of freedom                               362         362
  P-value (Chi-square)                           0.989       0.005
  Scaling correction factor                                  1.208
  Shift parameter                                          184.307
for simple second-order correction (Mplus variant)
```

```
Parameter Estimates:



  Information                                 Expected

  Standard Errors                           Robust.sem



Latent Variables:

Estimate  Std.Err  Z-value  P(>|z|)         Std.lv
Std.all

  FLEX =~

    FLEXIBILTY1       0.702    0.042   16.811    0.000    0.702
0.702

    FLEXIBILITY2      0.777    0.036   21.606    0.000    0.777
0.777

    FLEXIBILITY3      0.667    0.044   15.286    0.000    0.667
0.667

    FLEXIBILITY4      0.639    0.049   12.931    0.000    0.639
0.639

    FLEXIBILTRY5      0.736    0.042   17.551    0.000    0.736
0.736

  COLL =~

    COLLABORATION1    0.815    0.031   26.471    0.000    0.815
0.815

    COLLABORATION2    0.833    0.032   25.941    0.000    0.833
0.833

    COLLABORATION3    0.830    0.028   29.242    0.000    0.830
0.830

    COLLABORATION4    0.824    0.026   31.285    0.000    0.824
0.824

    COLLABORATION5    0.776    0.037   20.789    0.000    0.776
0.776
```

```
  SBR =~

    SBR1              0.818    0.035   23.215    0.000    0.818
0.818

    SBR2              0.816    0.032   25.615    0.000    0.816
0.816

    SBR3              0.802    0.035   23.085    0.000    0.802
0.802

    SBR4              0.748    0.040   18.547    0.000    0.748
0.748

    SBR5              0.769    0.037   20.676    0.000    0.769
0.769

  CS =~

    CS1               0.781    0.037   20.998    0.000    0.781
0.781

    CS2               0.781    0.038   20.685    0.000    0.781
0.781

    CS3               0.783    0.041   18.943    0.000    0.783
0.783

    CS4               0.777    0.035   21.915    0.000    0.777
0.777

    CS5               0.693    0.047   14.830    0.000    0.693
0.693

  AS =~

    AS1               0.749    0.045   16.834    0.000    0.749
0.749

    AS2               0.822    0.033   25.073    0.000    0.822
0.822

    AS3               0.764    0.036   21.026    0.000    0.764
0.764

    AS4               0.798    0.035   22.732    0.000    0.798
0.798

    AS5               0.891    0.025   35.048    0.000    0.891
0.891
```

```
  SCP =~

    SCP1              0.408    0.084    4.865    0.000    0.804
0.804

    SCP2              0.435    0.089    4.877    0.000    0.858
0.858

    SCP3              0.452    0.091    4.956    0.000    0.890
0.890

    SCP4              0.472    0.094    4.998    0.000    0.930
0.930




Covariances:

Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all

  FLEX ~~

    COLL              0.934    0.032   29.591    0.000    0.934
0.934

    SBR               0.968    0.032   29.957    0.000    0.968
0.968

    CS                0.945    0.031   30.015    0.000    0.945
0.945

    AS                0.928    0.032   29.207    0.000    0.928
0.928

  COLL ~~

    SBR               0.914    0.034   27.170    0.000    0.914
0.914

    CS                0.885    0.033   26.742    0.000    0.885
0.885

    AS                0.921    0.029   32.196    0.000    0.921
0.921

  SBR ~~
```

```
    CS                0.872    0.044   19.807    0.000    0.872
0.872

    AS                0.861    0.040   21.738    0.000    0.861
0.861

  CS ~~

    AS                0.892    0.039   23.157    0.000    0.892
0.892



Intercepts:

Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all

    FLEXIBILTY1       0.000                               0.000
0.000

    FLEXIBILITY2      0.000                               0.000
0.000

    FLEXIBILITY3      0.000                               0.000
0.000

    FLEXIBILITY4      0.000                               0.000
0.000

    FLEXIBILTRY5      0.000                               0.000
0.000

COLLABORATION1    0.000                                 0.000    0.000

    COLLABORATION2    0.000                               0.000
0.000

    COLLABORATION3    0.000                               0.000
0.000

    COLLABORATION4    0.000                               0.000
0.000

    COLLABORATION5    0.000                               0.000
0.000

SBR1              0.000                                 0.000    0.000

    SBR2              0.000                               0.000
0.000
```

SBR3	0.000	0.000	0.000
SBR4	0.000	0.000	0.000
SBR5	0.000	0.000	0.000
CS1	0.000	0.000	0.000
CS2	0.000	0.000	0.000
CS3	0.000	0.000	0.000
CS4	0.000	0.000	0.000
CS5	0.000	0.000	0.000
AS1	0.000	0.000	0.000
AS2	0.000	0.000	0.000
AS3	0.000	0.000	0.000
AS4	0.000	0.000	0.000
AS5	0.000	0.000	0.000
SCP1	0.000	0.000	0.000
SCP2	0.000	0.000	0.000
SCP3	0.000	0.000	0.000
SCP4	0.000	0.000	0.000

```
    FLEX              0.000                                 0.000
0.000

    COLL              0.000                                 0.000
0.000

    SBR               0.000                                 0.000
0.000

    CS                0.000                                 0.000
0.000

    AS                0.000                                 0.000
0.000

    SCP               0.000                                 0.000
0.000



Thresholds:

Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all

    FLEXIBILTY1|t1   -1.550    0.155   -9.986    0.000   -1.550   -
1.550

    FLEXIBILTY1|t2   -0.605    0.105   -5.777    0.000   -0.605   -
0.605

    FLEXIBILTY1|t3    0.023    0.098    0.233    0.816    0.023
0.023

    FLEXIBILTY1|t4    0.605    0.105    5.777    0.000    0.605
0.605

    FLEXIBILITY2|1   -1.795    0.183   -9.788    0.000   -1.795   -
1.795

    FLEXIBILITY2|2   -0.758    0.109   -6.966    0.000   -0.758   -
0.758

    FLEXIBILITY2|3   -0.191    0.099   -1.939    0.052   -0.191   -
0.191

    FLEXIBILITY2|4    0.699    0.107    6.525    0.000    0.699
0.699

    FLEXIBILITY3|1   -1.723    0.174   -9.896    0.000   -1.723   -
1.723
```

```
    FLEXIBILITY3|2   -0.586    0.104   -5.626    0.000   -0.586   -
0.586

    FLEXIBILITY3|3   -0.038    0.098   -0.388    0.698   -0.038   -
0.038

    FLEXIBILITY3|4    0.738    0.108    6.820    0.000    0.738
0.738

    FLEXIBILITY4|1   -1.602    0.160   -9.986    0.000   -1.602   -
1.602

    FLEXIBILITY4|2   -0.586    0.104   -5.626    0.000   -0.586   -
0.586

    FLEXIBILITY4|3    0.038    0.098    0.388    0.698    0.038
0.038

    FLEXIBILITY4|4    0.623    0.105    5.928    0.000    0.623
0.623

    FLEXIBILTRY5|1   -1.550    0.155   -9.986    0.000   -1.550   -
1.550

FLEXIBILTRY5|2   -0.431    0.101   -4.255    0.000   -0.431   -0.431

    FLEXIBILTRY5|3    0.023    0.098    0.233    0.816    0.023
0.023

    FLEXIBILTRY5|4    0.568    0.104    5.475    0.000    0.568
0.568

    COLLABORATION1   -1.456    0.147   -9.926    0.000   -1.456   -
1.456

    COLLABORATION1   -0.863    0.112   -7.685    0.000   -0.863   -
0.863

    COLLABORATION1   -0.114    0.098   -1.164    0.244   -0.114   -
0.114

    COLLABORATION1    0.660    0.106    6.227    0.000    0.660
0.660

    COLLABORATION2   -1.550    0.155   -9.986    0.000   -1.550   -
1.550

    COLLABORATION2   -0.799    0.110   -7.257    0.000   -0.799   -
0.799
```

```
    COLLABORATION2    -0.222    0.099    -2.249    0.025    -0.222    -
0.222

    COLLABORATION2     0.447    0.102     4.408    0.000     0.447
0.447

    COLLABORATION3    -1.723    0.174    -9.896    0.000    -1.723    -
1.723

    COLLABORATION3    -0.863    0.112    -7.685    0.000    -0.863    -
0.863

    COLLABORATION3    -0.176    0.098    -1.784    0.074    -0.176    -
0.176

    COLLABORATION3     0.699    0.107     6.525    0.000     0.699
0.699

    COLLABORATION4    -1.550    0.155    -9.986    0.000    -1.550    -
1.550

    COLLABORATION4    -0.886    0.113    -7.826    0.000    -0.886    -
0.886

    COLLABORATION4    -0.238    0.099    -2.404    0.016    -0.238    -
0.238

    COLLABORATION4     0.533    0.103     5.171    0.000     0.533
0.533

    COLLABORATION5    -1.373    0.140    -9.807    0.000    -1.373    -
1.373

    COLLABORATION5    -0.679    0.107    -6.376    0.000    -0.679    -
0.679

    COLLABORATION5    -0.253    0.099    -2.559    0.011    -0.253    -
0.253

    COLLABORATION5     0.301    0.099     3.022    0.003     0.301
0.301

    SBR1|t1           -1.795    0.183    -9.788    0.000    -1.795    -
1.795

    SBR1|t2           -0.738    0.108    -6.820    0.000    -0.738    -
0.738

    SBR1|t3           -0.253    0.099    -2.559    0.011    -0.253    -
0.253
```

```
    SBR1|t4           0.447    0.102    4.408    0.000    0.447
0.447

    SBR2|t1          -1.795    0.183   -9.788    0.000   -1.795   -
1.795

    SBR2|t2          -0.738    0.108   -6.820    0.000   -0.738   -
0.738

    SBR2|t3          -0.114    0.098   -1.164    0.244   -0.114   -
0.114

    SBR2|t4           0.605    0.105    5.777    0.000    0.605
0.605

    SBR3|t1          -1.550    0.155   -9.986    0.000   -1.550   -
1.550

    SBR3|t2          -0.799    0.110   -7.257    0.000   -0.799   -
0.799

    SBR3|t3          -0.191    0.099   -1.939    0.052   -0.191   -
0.191

    SBR3|t4           0.660    0.106    6.227    0.000    0.660
0.660

    SBR4|t1          -1.660    0.167   -9.958    0.000   -1.660   -
1.660

    SBR4|t2          -0.623    0.105   -5.928    0.000   -0.623   -
0.623

    SBR4|t3          -0.114    0.098   -1.164    0.244   -0.114   -
0.114

    SBR4|t4           0.641    0.106    6.078    0.000    0.641
0.641

    SBR5|t1          -1.550    0.155   -9.986    0.000   -1.550   -
1.550

    SBR5|t2          -0.623    0.105   -5.928    0.000   -0.623   -
0.623

    SBR5|t3          -0.191    0.099   -1.939    0.052   -0.191   -
0.191

    SBR5|t4           0.660    0.106    6.227    0.000    0.660
0.660
```

```
    CS1|t1          -1.723    0.174   -9.896    0.000   -1.723   -
1.723

    CS1|t2          -0.679    0.107   -6.376    0.000   -0.679   -
0.679

    CS1|t3          -0.038    0.098   -0.388    0.698   -0.038   -
0.038

    CS1|t4           0.738    0.108    6.820    0.000    0.738
0.738

    CS2|t1          -1.335    0.137   -9.731    0.000   -1.335   -
1.335

    CS2|t2          -0.641    0.106   -6.078    0.000   -0.641   -
0.641

    CS2|t3          -0.129    0.098   -1.319    0.187   -0.129   -
0.129

    CS2|t4           0.738    0.108    6.820    0.000    0.738
0.738

    CS3|t1          -1.413    0.143   -9.873    0.000   -1.413   -
1.413

    CS3|t2          -0.568    0.104   -5.475    0.000   -0.568   -
0.568

    CS3|t3          -0.084    0.098   -0.854    0.393   -0.084   -
0.084

    CS3|t4           0.586    0.104    5.626    0.000    0.586
0.586

    CS4|t1          -1.373    0.140   -9.807    0.000   -1.373   -
1.373

    CS4|t2          -0.699    0.107   -6.525    0.000   -0.699   -
0.699

    CS4|t3           0.008    0.098    0.078    0.938    0.008
0.008

    CS4|t4           0.586    0.104    5.626    0.000    0.586
0.586

    CS5|t1          -1.660    0.167   -9.958    0.000   -1.660   -
1.660
```

```
    CS5|t2           -0.641    0.106   -6.078    0.000   -0.641   -
0.641

CS5|t3            0.038    0.098    0.388    0.698    0.038    0.038

    CS5|t4            0.842    0.112    7.544    0.000    0.842
0.842

    AS1|t1           -1.456    0.147   -9.926    0.000   -1.456   -
1.456

    AS1|t2           -0.568    0.104   -5.475    0.000   -0.568   -
0.568

    AS1|t3           -0.084    0.098   -0.854    0.393   -0.084   -
0.084

    AS1|t4            0.447    0.102    4.408    0.000    0.447
0.447

    AS2|t1           -1.299    0.135   -9.646    0.000   -1.299   -
1.299

    AS2|t2           -0.660    0.106   -6.227    0.000   -0.660   -
0.660

    AS2|t3           -0.129    0.098   -1.319    0.187   -0.129   -
0.129

    AS2|t4            0.679    0.107    6.376    0.000    0.679
0.679

    AS3|t1           -1.602    0.160   -9.986    0.000   -1.602   -
1.602

    AS3|t2           -0.679    0.107   -6.376    0.000   -0.679   -
0.679

    AS3|t3           -0.238    0.099   -2.404    0.016   -0.238   -
0.238

    AS3|t4            0.551    0.103    5.323    0.000    0.551
0.551

    AS4|t1           -1.550    0.155   -9.986    0.000   -1.550   -
1.550

    AS4|t2           -0.679    0.107   -6.376    0.000   -0.679   -
0.679
```

```
    AS4|t3           -0.053    0.098   -0.543    0.587   -0.053   -
0.053

    AS4|t4            0.551    0.103    5.323    0.000    0.551
0.551

    AS5|t1           -1.602    0.160   -9.986    0.000   -1.602   -
1.602

    AS5|t2           -0.799    0.110   -7.257    0.000   -0.799   -
0.799

    AS5|t3           -0.481    0.102   -4.714    0.000   -0.481   -
0.481

    AS5|t4            0.145    0.098    1.474    0.140    0.145
0.145

    SCP1|t1          -1.973    0.211   -9.357    0.000   -1.973   -
1.973

    SCP1|t2          -0.955    0.116   -8.239    0.000   -0.955   -
0.955

    SCP1|t3           0.084    0.098    0.854    0.393    0.084
0.084

    SCP1|t4           1.083    0.122    8.887    0.000    1.083
1.083

    SCP2|t1          -1.660    0.167   -9.958    0.000   -1.660   -
1.660

    SCP2|t2          -0.758    0.109   -6.966    0.000   -0.758   -
0.758

    SCP2|t3          -0.084    0.098   -0.854    0.393   -0.084   -
0.084

    SCP2|t4           0.863    0.112    7.685    0.000    0.863
0.863

    SCP3|t1          -1.456    0.147   -9.926    0.000   -1.456   -
1.456

    SCP3|t2          -0.641    0.106   -6.078    0.000   -0.641   -
0.641

    SCP3|t3          -0.129    0.098   -1.319    0.187   -0.129   -
0.129
```

```
    SCP3|t4           0.886    0.113    7.826    0.000    0.886
0.886

    SCP4|t1          -1.602    0.160   -9.986    0.000   -1.602   -
1.602

    SCP4|t2          -0.799    0.110   -7.257    0.000   -0.799   -
0.799

    SCP4|t3          -0.285    0.099   -2.868    0.004   -0.285   -
0.285

    SCP4|t4           0.586    0.104    5.626    0.000    0.586
0.586



Variances:

Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all

    FLEXIBILTY1       0.508                                0.508
0.508

    FLEXIBILITY2      0.397                                0.397
0.397

    FLEXIBILITY3      0.555                                0.555
0.555

    FLEXIBILITY4      0.591                                0.591
0.591

    FLEXIBILTRY5      0.459                                0.459
0.459

COLLABORATION1    0.335                                0.335    0.335

    COLLABORATION2    0.305                                0.305
0.305

    COLLABORATION3    0.311                                0.311
0.311

    COLLABORATION4    0.321                                0.321
0.321

    COLLABORATION5    0.398                                0.398
0.398
```

SBR1	0.331	0.331	0.331
SBR2	0.334	0.334	0.334
SBR3	0.357	0.357	0.357
SBR4	0.440	0.440	0.440
SBR5	0.409	0.409	0.409
CS1	0.390	0.390	0.390
CS2	0.389	0.389	0.389
CS3	0.387	0.387	0.387
CS4	0.396	0.396	0.396
CS5	0.520	0.520	0.520
AS1	0.439	0.439	0.439
AS2	0.324	0.324	0.324
AS3	0.417	0.417	0.417
AS4	0.363	0.363	0.363
AS5	0.207	0.207	0.207
SCP1	0.353	0.353	0.353
SCP2	0.263	0.263	0.263

```
    SCP3              0.207                                    0.207
0.207

    SCP4              0.136                                    0.136
0.136

    FLEX              1.000                                    1.000
1.000

    COLL              1.000                                    1.000
1.000

    SBR               1.000                                    1.000
1.000

    CS                1.000                                    1.000
1.000

    AS                1.000                                    1.000
1.000

    SCP               1.000                                    0.257
0.257



Scales y*:

Estimate  Std.Err  Z-value  P(>|z|)   Std.lv  Std.all

    FLEXIBILTY1       1.000                                    1.000
1.000

    FLEXIBILITY2      1.000                                    1.000
1.000

    FLEXIBILITY3      1.000                                    1.000
1.000

    FLEXIBILITY4      1.000                                    1.000
1.000

    FLEXIBILTRY5      1.000                                    1.000
1.000

COLLABORATION1    1.000                                1.000    1.000

    COLLABORATION2    1.000                                    1.000
1.000
```

```
    COLLABORATION3    1.000                                    1.000
1.000

    COLLABORATION4    1.000                                    1.000
1.000

    COLLABORATION5    1.000                                    1.000
1.000

SBR1              1.000                                1.000    1.000

    SBR2              1.000                                    1.000
1.000

    SBR3              1.000                                    1.000
1.000

    SBR4              1.000                                    1.000
1.000

    SBR5              1.000                                    1.000
1.000

    CS1               1.000                                    1.000
1.000

    CS2               1.000                                    1.000
1.000

    CS3               1.000                                    1.000
1.000

    CS4               1.000                                    1.000
1.000

    CS5               1.000                                    1.000
1.000

    AS1               1.000                                    1.000
1.000

    AS2               1.000                                    1.000
1.000

    AS3               1.000                                    1.000
1.000

    AS4               1.000                                    1.000
1.000
```

```
    AS5                 1.000                                 1.000
1.000

    SCP1                1.000                                 1.000
1.000

    SCP2                1.000                                 1.000
1.000

    SCP3                1.000                                 1.000
1.000

    SCP4                1.000                                 1.000
1.000
```