

**MANAGING SUPPLY CHAIN RISKS WITHIN THE STATE  
DEPARTMENT OF AGRICULTURE, KENYA**

By

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**DECLARATION**

I would like to declare that this submission towards the award of Master of Business Administration is my original work and does not contain any work published previously by any other person.

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Signature..... Date.....

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This research project has been submitted for examination and I have approved it as the university supervisor:

**MR. MICHAEL K. CHIRCHIR**

Signature..... Date.....

## **DEDICATION**

I dedicate this research to my father Patrick Muniafu Kisaka and My late mother Veronica Nasambu for all the sacrifices and support they gave me towards my education to this point.

To my loving son Michael Ndeda who stayed late nights with me, studying.

**GOD BLESS YOU**

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## ABSTRACT

Supply chain risks in the public sector continue to dominate the agenda of many Governments' fiscal policy with the aim advancing transformation and opportunity. However the supply chain risks in the public sector remain under-researched and mitigation strategies are not well documented. The research project addressed the following objectives: (i) to identify supply chain risks within the public sector in Kenya with special reference to the Department of Agriculture, (ii) To establish mitigation measures for key supply chain risks that sought to enable effective and efficient supply chain management (iii) to establish the challenges faced in mitigation supply chain risks within the public sector. The research design incorporated empirical, descriptive and survey research to evaluate supply chain risks and empirically analyse the information. A two stage sampling technique was used to delineate the target population in to the two strata of department staff and suppliers. Secondary data was collected from published literature while primary data was collected using the interview method guided by a structured questionnaire. Both descriptive and statistical analysis was undertaken using SPSS vs 19. The Relative Importance Index (RII) ranked the top ten risk drivers in order of importance. The ranking of the broader risk categories using the RII identified procurement risk as critical and needing Government attention to address exchange rate risks, single sourcing (non competitiveness), and unrealistic contract duration risk. Using PCA, seven principal components (PCs) with Eigen values above 1 were extracted from the covariance matrix. Reducing the consequence of risk and transferring risk were identified as the preferable mitigation strategy. The challenges to addressing risk in the public sector was identified as inadequate budget, political interference among others The study concludes and recommends that the classification and management of supply chain risks is a fundamental ingredient to effective management and governance in the public sector and the responsibility of risk mitigation responsibility actually resides with staff at all levels of the entity. Suggestions for further research include a comparative analysis of public vs private sector risk and also undertaking an impact assessment of risks on the performance of the public sector.

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## **ABBREVIATIONS AND ACRONYMNS**

EACC	Ethics and Anti-Corruption Commission
SC	Supply Chain
GDP	Gross Domestic Product
KNBS	Kenya National Bureau of Statistics
PCA	Principal Components Analysis
PCs	Principal Components
RII	Relative Importance Index
SPSS	Statistical Package for Social Scientists
EAAPP	Eastern Africa Agricultural Productivity Project

# **CHAPTER I**

## **INTRODUCTION**

### **1.1 Background**

Supply chain risks have received considerable and increasing attention in Governments as their activities and operations become complex (Jüttner, 2005; Ziegenbein, 2007). While Government seeks to balance the cost effectiveness and efficiency with quality in the delivery of services, it is also obligated to address the socio-economic transformation of the country. In Kenya, this involves the inclusion of minority groups as participants in the supply chain (SC) process through the delivery of goods and services (Njiraini and Wangombe, 2013). The Kenyan government spends an estimated 70 percent (~1 billion Kenyan shillings or \$11.7 million), of its budget on the procurement of goods and services. The government's "preferential procurement policy" has reserved 30 percent of these expenses to be paid to enterprises owned by youth, women and the disabled (Njiraini and Wangombe, 2013).

While these policies are premised on the inclusivity of small enterprises in the creation of wealth in the country, the measures of making supply chain systems more inclusive, efficient and responsive have also made them more vulnerable to risks. Managers are therefore challenged to address the opportunities and risks of supply chain systems at operational and strategic level (Cucchiell and Gastaldi, 2006). The development and implementation of strategies to make the supply chain system within the public sector more competitive is therefore vital.

Reforms introduced to guide the supply chain process in the public sector and address some of the supply chain risks, the sector is exposed to include the Public Procurement and Disposal Act (PPDA), (2005) which provides guidelines for public procurement, to address the leakage of resources within the supply chain, The Public Procurement and Oversight Authority (PPOA) whose mandate is to monitor and ensure that the Procurement Procedures established under the act are complied with. Similarly the Ethics and Anti-Corruption Commission (EACC) has been established to combat and prevent corruption and economic crime in Kenya.

The World Bank (2009) asserts that the basic function of supply chain management in the public sector is managing and coordinating all of the supply chain activities necessary to support the organization's strategy of getting the right quantity of the product to the right place at the right time. In the case of the agricultural sector, this includes sourcing, procurement, transport, warehousing and farmer support. It also includes coordination and collaboration with channel partners, which can be funders, suppliers, intermediaries, third-party service providers, and customers. Supply chain management usually includes supply chain planning, a process of analyzing, evaluating and defining the supply chain strategies, including network design, sourcing, transportation and inventory policy.

### **1.1.1 Supply Chain Risks**

Supply chain risk can be referred to as an exposure to an event which causes disruption, thus affecting the efficient management of the supply chain network. Thus according to Christopher and Lee (2004), risk management should be considered as an integral part of a holistic supply chain management design. Risk on the other hand is defined as a disruption, vulnerability, uncertainty, disaster, peril and hazard (Tang, 2006). Academic literature within the domain of supply chain has sought to differentiate between the various forms by focusing on the availability of information and the intensity of these events. Hence, this can range from completely unknown to the completely known serious and immediate danger (Van der Vorst and Beulens, 2002).

Supply chain risks can generally be categorised into the two main types of external and internal risks. The external risks are those that are outside of the institution's control, while the internal risks are those that are within the institutions control. External risks can be driven by events either upstream or downstream in the supply chain. Chopra and Sodhi (2004) present the 5 main types of external risks namely demand risks caused by unpredictable or misunderstood customer or end-customer demand; supply risks caused by any interruptions to the flow of product, whether raw material or parts, within your supply chain; environmental risks from outside the supply chain; usually related to economic, social, governmental, and climate factors, including the threat of terrorism; business risks caused by factors such as a supplier's financial or management stability, or purchase and sale of supplier companies; and physical plant risks caused by the condition of a supplier's physical facility and regulatory compliance.

Internal risks provide better opportunities for mitigation because they are within your business's control. There are 5 main types of internal risks namely manufacturing risks caused by disruptions of internal operations or processes; business risks caused by changes in key personnel, management, reporting structures or business processes, such as the way purchasers communicate to suppliers and customers; planning and control risks caused by inadequate assessment and planning, which amount to ineffective management; mitigation and contingency risks caused by not putting contingencies (or alternative solutions) in place in case something goes wrong; and cultural risks caused by a business's cultural tendency to hide or delay negative information. Such businesses are generally slower to react when impacted by unexpected events (Rao and Goldsby, 2009)

There is no simple solution to managing supply chain risk. The implementation of one strategy in mitigating a particular risk may cause the supply chain to face another risk. Therefore it is important for all members of the supply chain to have a common understanding of supply chain risk. Since each supply chain is unique, the risk mitigation strategies should be tailored accordingly to suit the entire supply chain (Chopra and Sodhi 2004)

### **1.1.2 State Department of Agriculture, Kenya**

According to the Strategic Plan (2008-2012) of the Ministry of Agriculture, its mandate is to promote and facilitate production of food and agricultural raw materials for food security and incomes; advance agro-based industries and agricultural exports; and enhance sustainable use of land resources as a basis for agricultural enterprises. This mandate is embedded in the vision of being the leading agent towards achievement of food security for all, employment creation, income generation and poverty reduction in Kenya. The Ministry's mission is to improve the livelihoods of Kenyans by promotion of competitive agriculture through creation of an enabling environment, provision of support services and ensuring sustainable natural resources.

There are three main departments within the State Department of Agriculture. They are the Technical Department, Finance and Accounts and Administration, each headed by a Head of

Department. The Technical Department has five Directorates for effective service delivery. These are Directorate of Crop Management, Directorate of Policy and External Relations, Directorate of Agribusiness and Market Development, Directorate of Extensions, Research Liaison & Training, Directorate of Agricultural Engineering Services. The Finance and Accounts Department plays a pivotal role in providing quality accounting services through proper maintenance of accounting records and timely provision of financial reports to enhance rapid and sustainable development. The Administrative Department consists of Planning, Supply Chain, Human Resource Management, Public Communications and Information Communication and Technology (Ministry of Agriculture: <http://www.kilimo.go.ke/>. Accessed 10 May 2014).

The importance of the ministry is premised on the fact that Agriculture is the major contributor of the Kenyan economy. It is the leading economic sector, accounting for 25% of the Gross Domestic Product (GDP). The sector also accounts for 65 per cent of Kenya's total exports and provides more than 18 per cent of formal employment. Growth of the national economy is therefore highly correlated to growth and development in agriculture (Kibet, 2011)

According to the Government of Kenya (2007), the vision 2030 strategy has identified agriculture as one of the six key economic sectors expected to drive the economy to a projected 10 percent economic growth annually over the next two decades through promotion of an innovative, commercially-oriented and modern agriculture. The goal in this sector is to stimulate additional Ksh 80 billion, which is approximately US dollars 1 billion, to Ksh 90 billion increase in GDP.

## **1.2 Statement of the Problem**

The past decades have witnessed growth and expansion in supply chains, with the aim to increase productivity, lower costs and fulfil demands in emerging markets. The increasing complexity in a supply chain hinders visibility and consequently reduces one's control over the process (Posadas, 2000). Cases of service delivery disruption, as is common with many Government departments, have shown that a risk event occurring at one point of the supply chain can greatly affect other aspects of the system, if the disruption is not properly controlled

(Palas and Wood, 2009). Supply chain management thus faces a pressing need to maintain the expected output of the system in risk situations (Musa, 2012). To achieve this, there is a need to identify potential risks and evaluate their impacts, and at the same time design risk mitigation policies to locate and relocate resources to deal with risk events.

In Kenya, Gituma (2013) explored supply chain systems within the petroleum industry. The researcher examined the level of professionalism in enhancing performance of supply chain management in the petroleum industry. The study showcased the milestones of the public sector reforms in enhancing performance of the supply value chain. Musuya and Namusonge (2013) assessed factors that affected the implementation of supply chain practices in public health sector In Kenya. Using a sample of 47 hospital management teams, the study found that most supply chain management- linked problems originated from uncertainties or inability to coordinate activities and partners within the public health system. Both studies did not identify the various risks within the supply chain and possible mitigating factors. This study seeks to fill this gap.

Kadima *et al.*, (2013) analysed the effect of supply chain risks on construction project implementation in public universities using a descriptive survey design. The study found that despite the efforts made by the public sector reforms to strengthen the supply chain system in Kenya, a number of government funded construction projects in the public sector exceed the contract sum, time schedule or general gross inefficiency. This study supported the need to undertake a study to address mitigation of supply chain risks in the public sector.

Nzuve (2011) examined factors affecting e-procurement in the private sector. Using factor analysis, the study identified four strategic factors that determined the use of e-procurement in the health private sector. It is important to note that the focus of the study was on one aspect of the supply value chain, which is e-procurement, and also the study was on the private sector. This presents the gap to undertake a study on the value chain in the public sector.

In spite of having various studies undertaken on supply chain risks by various researchers, (Posadas, 2000; Gituma, 2013) and others, none of the studies have specifically addressed the

supply chain risks within the public sector. There is also limited literature available on public sector supply chain processes and this has created a major knowledge gap amongst supply chain managers on how to improve the process in Government Ministries.

It is therefore against this background that this study was undertaken to investigate supply chain risks within the public sector, with a specific reference to The State Department of Agriculture in Kenya. This study sought to fill this gap of addressing supply chain challenges, while laying the foundation for successful planning, financing and execution of procurement of goods and services by the Department. This study was necessitated by the paucity of academic research in the area of supply chain risks and mitigating factors in supply chain management in Kenya. Hence the study sought to answer the following questions: What are the supply chain risks in the public sector particularly within The State Department of Agriculture; what mitigation measures can be put in place in order to address potential supply chain risks and what are some of the challenges faced by public servants and suppliers in mitigating supply chain risks?

### **1.3 Research Objectives**

The overall goal of this research project is to enhance public sector effectiveness by ensuring equity, service delivery and overall economic growth through efficient supply chain management system. Specifically the research project sought to address the following objectives:

- i) To identify supply chain risks within the public sector in Kenya with special reference to the Department of Agriculture.
- ii) To establish mitigation measures for key supply chain risks that seek to enable effective and efficient supply chain management.
- iii) To establish the challenges faced in mitigating supply chain risks within the public sector.

### **1.4 Value of the Study**

This study sought to propose policy recommendations that could impact the delivery of Government goods and services through an effective and efficient supply chain management

system implemented by the Department of Agriculture. Specifically it provided useful insights to Government, researchers and practitioners on how best to ensure equity, service delivery and economic growth. The study also presented useful information on supply chain management systems within the Department of Agriculture with the aim of critically analysing the system and proposing a framework to improve the system.

The findings of this study further provided a body of knowledge that will be relevant for further research in the area of supply chain management in the public sector and how best to address bureaucratic bottlenecks that hinder efficient delivery of services by Government, while at the same time seeking to address the challenges of fraud and corruption.



## CHAPTER II

### LITERATURE REVIEW

#### 2.1 Introduction

There is a progressive call for managers to deal with a multiplicity of prospects and threats at both operational and strategic levels within the supply chain system. Various disciplines have incorporated risk as an aspect for study. These include business, economics, agriculture, engineering, accounting, finance, information technology and operations (Cucchiella and Gastaldi, 2006). Risk is defined as the “likelihood for an uncommon event to happen, and the negative effects this event will have on the organization” (Khan and Burnes, 2007). Risk hence depends on the likelihood of the occurrence, the quantity of the likely outcome, the impact of these outcomes (Mitchell, 1995; Khan and Burnes, 2007) and the pathway that leads to the event (Ritchie and Brindley, 2007).

The debate on whether risk is objective or subjective rages on as well as whether it is positive or negative. The subjectivity of risk is dependent on the principles and reputation of the institution and dealt with on an individual basis. If it is objective it would require the development of a structured framework for the identification, management and mitigation of risk (Khan and Burnes, 2007). Spekman and Davis (2004) indicate that risk which relies on probability alone, such as coin flipping or dice throwing, is considered to be objective. However, when the consequences of risk need to be assessed along with its expectation of occurrence, it is categorised as subjective risk. Universally, risk management narrative is viewed as negative (Mitchell, 1995; Harland *et al.*, 2003) and risk management is synonymous with minimising risk.

Khan and Burnes (2007) argues that deficiency of clear-cut definition and elucidation in the general literature on risk and its application to the supply chain risk management area makes it hard to transfer the wide range of risk management tools available in the general literature to supply chain risk management. Which begs the question “what is supply chain risk?”(Musa, 2013). The lack of apparent parameters to describe risk, calls for an exhaustive study to define supply chain risk. Additionally, the growth and complexity of global supply chain, necessitates that the traditional meaning of supply chain risk needs urgent revision (Barry, 2004; Quinn, 2006).

Gaonkar and Viswanadham (2007) have defined risk in the supply chain as the “distribution of the loss resulting from the variation in possible supply chain outcomes, their likelihood and their subjective value”. Thus, the supply chain risk have an effect on both upstream and downstream operations in the supply chain and can be explained as a result of the likelihood of interruption and the impact of such interruption.

## **2.2 Supply Chain Risks**

Comparatively unstable operating environment and increasingly susceptible supply chains indicate that present supply chains are more susceptible than ever. Elkins *et al.*, (2005) reports an increase in the prospect for disruptions and in their extent. There has been a long-term upward trend in the number of catastrophic events and the amount of economic and insured losses since 1950 (Muich Re, 2007). Thus, external environmental factors that are outside the control of the organization, as well as internal factors, have made the supply chains vulnerable and sensitive to disruptions.

The dynamic socio-economic landscape coupled with globalisation and increased competitiveness calls for firms to ensure that their supply chains are responsive and efficient. This includes among others outsourcing, off-shore manufacturing, innovation, reducing inventories and supplier base, single sourcing, public private partnerships could enable institutions achieve a lean an efficient supply chain process (Gaonkar and Viswanadham, 2007). These strategies, though proposed to deal to make SC more resilient and agile while improving efficiency, have the effect of exposing institutions’ SCs to disturbances. This is due to the complex and global nature of interconnected supply chains (Cousins *et al.*, 2004). Supply chain interruptions can also negatively have an effect on the stock price and shareholder value of an organization (Hendricks and Singhal, 2005). A leaner and more interconnected supply chain is susceptible to vulnerability as is the case in today’s supply chains (Wagner and Bode, 2008).

The evaluation and management of SC risks require an understanding and the different types of risks, their source and effects. Several authors have categorised supply chain risk either based on their sources, causes or sources of uncertainty (Chopra and Sodhi, 2004; Gaonkar and Viswanadham, 2007).

Rao and Goldsby (2009) present the framework for supply chain risks as adapted and presented in Figure 1 in Appendix I. This presents the broad picture for general supply chain risks.

Ritchie and Brindley (2007) characterize supply chain risks into seven main groups - environment setting, industry specific, supply chain set-up, supply chain participants, organization's policy, crisis specific variables and management/decision making section. Similarly, Wagner and Bode (2008) noted that supply chain risk sources can be categorised into five groups – supply side, demand side, regulatory, legal/bureaucratic, infrastructure and catastrophic. Chopra and Sodhi (2004) divide risks into nine different groups – disruptions, delays, systems, forecast, intellectual property, procurement, receivables, inventory and capacity.

Risk in supply chain is a comparatively novel area of research and is not well understood nor documented (Khan and Burnes, 2007). Researchers' example Hendricks and Singhal (2005) assessed the effect of SC risk on company's performance. A 10% drop in share price was reported due to severe disruptions in the supply chain, hence affecting the company's performance to drop by 40%. Wagner and Bode (2008) on the other hand found that interruptions in the SC did not have a direct impact on the performance of the company arguing that the risk from unnatural disasters is often overestimated. It is noted that the researchers Hendricks and Singhal (2005) and Wagner and Bode (2008) used different dependent variables in their research. While Hendricks and Singhal (2005) used the company's share market value, Wagner and Bode (2008) measured the impact of supply chain disruptions on overall supply chain performance.

Studies that have focussed on the various types of risk include Cucchiella and Gastaldi (2006); Gaonkar and Viswanadham (2007) and Ritchie and Brindley (2007). Researchers that provided general guidelines for managing the supply chain risk include Chopra and Sodhi, (2004) and Craighead *et al.*, (2007). However, little or no research has been published that specifically addresses the SC risks within the public sector. This is notwithstanding the fact that the public sector is central to the Governments delivery programmes of goods and services to ensure equity and service delivery.

### **2.3 Supply Chain Risk Management**

Despite previous discussions of supply chain risk, only recently have institutions incorporated supply chain management as a core business function. Supply chain risk management is hence still in the early stages. Notwithstanding it would be beneficial to incorporate in the supply chain, risk mitigation strategies (Ritchie and Brindley 2007).

To manage supply chain risk, Kouvelis *et al.*, (2006) proposes the management of the uncertainty of demand, supply and costs. Carter and Rogers (2008) define supply chain risk management as “the ability of a firm to understand and manage its economic, environmental, and social risks in the supply chain” which could be materialised by the adoption of contingency planning and having a resilient and agile supply chains. While Deloitte and Touche (2004) and Tang (2006) described supply chain risk management as the procedure that incorporates managing, supervising and assessing supply chain risk and maximising actions to avoid interruptions and/or to swiftly address disruption.

The supply chain risk management process is presented in Figure 2 in Appendix II. The process broadly constitutes: risk analysis incorporating risk identification, assessment and response and secondly risk control incorporating risk mitigation and monitoring (Neiger *et al.*, 2009). Proper implementation of all stages in this process will result in the recognition of potential risk affecting the supply chain. Manuj and Menzer (2008) believe that managing risk should at least comprise the processes of identification, evaluation and mitigation.

According to Musa (2013) Risk identification involves determining which risks are likely to affect the supply chain and documenting the characteristics of each risk. It is proposed that risk identification should be undertaken on a regular basis throughout the life cycle of the supply chain. Further risk identification should address both the internal and external risks.

During the risk assessment phase, the likelihood/probability of the risk occurring and the severity of the impact of the identified risk are quantified. Potential risks are graded and classified as to whether they are low, medium or high in their likelihood that they will occur.

Risk assessment in the context of risk management is a continuous and iterative interplay of actions that take place throughout the supply chain (Manuj and Menzer, 2008).

For each risk with an inherent score, the following response strategies could be applied: avoidance (through eliminating specific threat by eliminating cause), reduction (taking action to reduce the probability of the supply chain risk occurring), sharing (sharing risk with or shifting risk to others e.g. (outsourcing) and acceptance (accepting risk with low impact or deal with the consequences of the risk) (Manuj and Menzer, 2008).

According to Musa (2013) risk mitigation is a proactive and a reactive measure. It aims to lessen the effects that assessed risk might have on different tasks of the supply chain or the outcome of the supply chain process. The broad actions of risk mitigation actions include pre-emptive actions or contingency actions. Manuj and Menzer (2008) propose that risk mitigation actions should be cost effective and efficient in that they aim to reduce risk exposure in the supply chain. Risk monitoring and control involve the monitoring of risk plans to ensure the achievement of the outlined objectives.

Supply chain risk management strategies recommended by authors Ritchie and Brindley (2007) include risk indemnity, information sharing, partnerships, outlined performance benchmarks, customary cooperative reviews, mutual training and improvement programs, joint pro-active evaluations and preparation exercises, expanding risk management awareness and skills, combined strategies, inter-partnership structures, and relationship marketing initiatives. They have provided a framework to classify and manage risks and demonstrated with two case studies how their framework can help mitigate these risks.

Chopra and Sodhi (2004) suggest “stress testing” and “tailoring” strategy. Stress testing involves the identification of core processes/suppliers/customers, logistics, inventory, capacity etc, and then proposing alternative scenarios in case of interruptions in the supply chain. This presents managers with a risk management plan with options to prioritise and address potential risks.

## **2.4 Public Sector Supply Chain Risks**

World over, the public service plays a central role in any country's socio-economic development. In an increasingly changing global environment, the mandate, structure and operations of public service must be reshaped and productivity enhanced to make it more focused, efficient and responsive to the needs of those it serves (Muthaura, 2010).

The public sector refers to the part of the economy concerned with providing various government services. The composition of the public sector varies by country, but in most countries the public sector includes such services as the military, police, public transit and care of public roads and education system, along with healthcare and those working for the government itself, such as elected officials. The public sector might provide services that a non-payer cannot be excluded from (such as street lighting), services which benefit all of society rather than just the individual who uses the service (Lloyd, 1984).

David (2002) argues that any Government is fully aware of the fact that a proper public sector is a product of the state's public policy, which provides high-quality and well-functioning educational, healthcare and social security systems through the effective management and use of public funds. Only a well-functioning and efficient public sector is capable of supporting the qualitative development of society, ensuring social and economic equilibrium, and providing life's certainties to citizens. Many Governments hence place emphasis on improving the effectiveness and quality of services delivered by the public sector, while respecting the possibilities determined by the long-term sustainability of public finances.

According to Edward (2009) supply chain risk in the public sector continues to dominate the agenda of many Governments' fiscal policy with the aim advancing transformation and opportunity. These risks can be presented in the form of compliance threats which originate in politics, law, regulation or corporate governance; financial threats that stem from the economic risk that value may be lost; strategic threats related to public policy and the fear that it will not be successful or cause stakeholder dissatisfaction; and operational threats pertaining to hindrances that may arise during the delivery of services and policy implementation.

Similarly, Manea and Popa (2010) argue that throughout the SC process, due to the effect of the interaction among the components of the supply chain system, certain actions with significant negative effects on its optimal operation may occur. Risks may turn into certainty either because of a simple error in the development and administration of the SC process, or because of a deliberate deviation from the existing legal provisions. Therefore, there is an imperative for the implementation of certain risk-avoiding measures, as well as of measures aiming to reduce their negative effects in case of their occurrence.

Managing the risk typically involves mapping the supply chain, measuring the risk of critical nodes in the supply chain network, identifying appropriate risk reduction mechanisms for high-risk nodes and deploying specific actions to mitigate the risk at these nodes, including initiating inventory visibility systems and deploying collaborative processes with key supply chain partners (Olson and Wu, 2010).

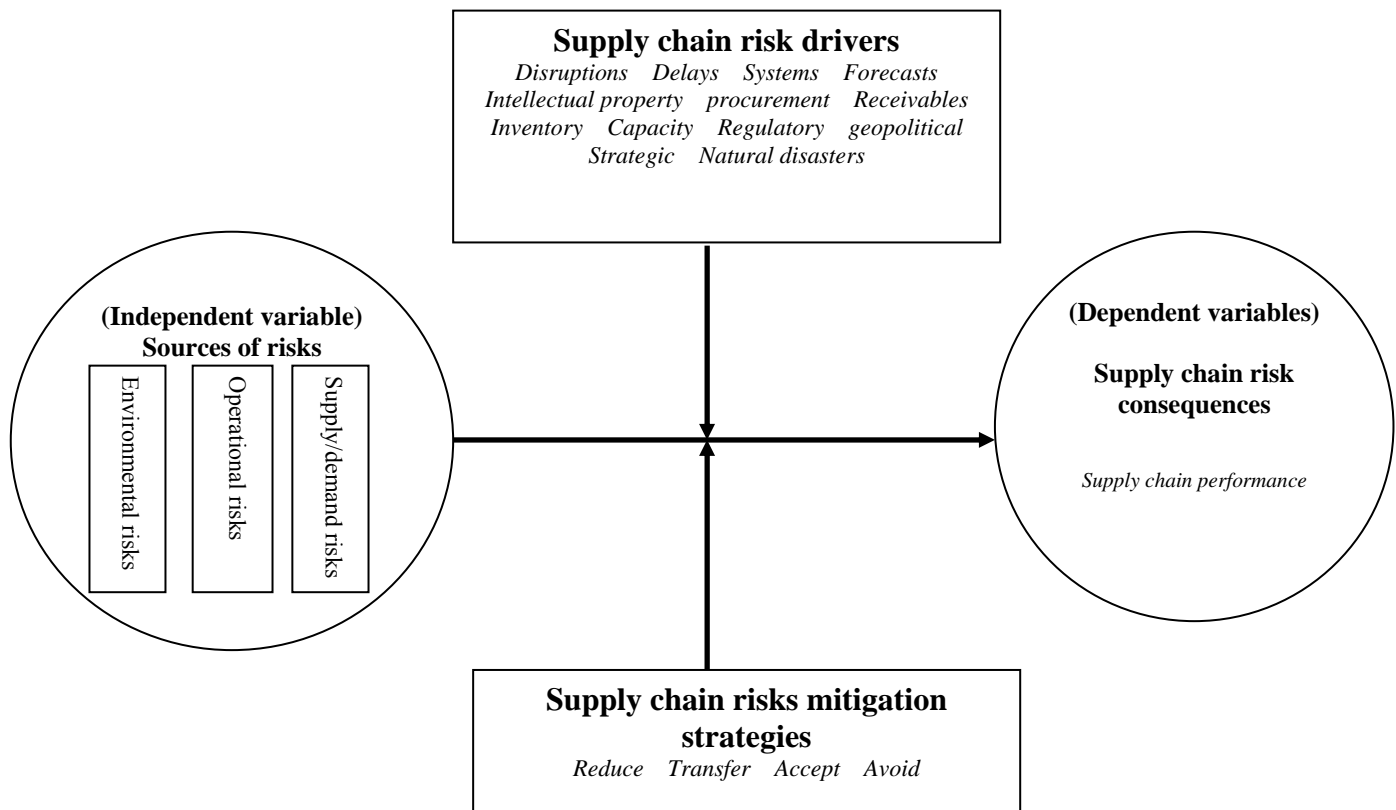
## **2.5 Conceptual Model**

A review of literature in the area of supply chain management has presented various research approaches used in the analysis of supply chain risk management. What is also clear is the lack of exhaustive literature in the area of supply chain management. The complex and interconnected nature of supply chain further necessitates the study of supply chain risk management as well as the research methods and approaches used in its analysis. This lays credence to informing the research methods and approaches to be used in this study.

While majority of the studies have use qualitative approaches example Olson and Wu (2010); Neiger *et al.*, (2009) and Christopher and Lee (2004), a few authors e.g. Levary (2007) and Nzube (2012) have used quantitative approaches. The qualitative research approaches used include conceptual models, overviews and exploratory reviews (Harland *et al.*, 2003; Peck *et al.*, 2003), as well as empirical studies such as industrial cases, interviews and surveys (Amaral *et al.*, 2006; Crone, 2006). The quantitative approaches include risk ranking systems, (Levary, 2007) and factor analysis (Nzube, 2012 and Awino, 2007).

While there has been an increase in research in quantitative studies, majority of these studies still focus on specific areas within the supply chain, and discount the necessity to address supply

chain as an integrated system. This may be due to the challenge of analysing and managing risk issues in a complex, integrated supply chain system. Based on the critical analysis of literature reviewed, this study shall incorporate both qualitative and quantitative research approaches. The qualitative aspect will cover the perspectives of supply chain risk in the public sector as well as policy issues. While the quantitative approach will seek to use factor analysis to isolate critical risks which will guide Government in targeting mitigation measures to improve the public sector supply chain system. Figure 1 below shows the supply chain risks management conceptual framework incorporating the variables used in the study.



**Figure 1: Conceptual framework for supply chain risk management**  
*(Adapted from Svensson, 2000 and Musa, 2012)*

The conceptual model in Figure 1 presents the four basic constructs applied in this study. These are supply chain risk sources, risk consequences, risk drivers and risk mitigating strategies. These constructs provide the background for probing the concept and provide the foundation for synthesising the emergent issues of this research. The risks sources are broadly categorised as environmental, organisational, supply and demand related variables which cannot be predicted with certainty and which impact on the supply chain outcome variables. The risks sources in this



study are unpacked and the variables used in the principal component analysis of this study. The risk consequences refer to the supply chain outcome variables as is manifested by the variance due to risk sources.

Jüttner *et al.*, (2003) in defining the concept of supply chain risk management, makes a distinction between supply chain risk drivers and risk mitigating strategies. The drivers are broadly represented within the categories of disruptions, delays, systems, forecasts, intellectual property, procurement, receivables, inventory, capacity, regulatory, geopolitical, strategic and natural disasters. Using the relative importance index, the research study identifies and ranks the critical risk drivers. The risk mitigating strategies are the strategic moves organisations deliberately undertake to mitigate the uncertainties identified from the various risk sources (Miller, 1992). In this study the risk mitigation strategies are presented as reducing the risk, transferring the risk, avoiding the risk and accepting the risk.

## **CHAPTER III RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter describes the research methodology, outlining the study area, research design, population and sampling, data collection methods and instruments, and the data analysis. The reliability and validity of the research instruments are also addressed.

### **3.2 Research Design**

Empirical, descriptive and Survey research was used in this study. Survey research is a recognised methodology, according to Rungtusanatham (2003), for comprehending the mainstay issues and challenges that supply chain risk management faces. Similar methods have been used by Chen *et al.*, (2012) to evaluate supply chain risks and its empirical analysis for Apparel processing enterprises. Nzuve (2013) used the descriptive research design as well as empirical research and survey approach to examine factors influencing e-procurement implementation among private hospitals in Kenya. Awino (2007) also used various empirical methods and survey methods to obtain relevant data that was used to develop a broad based understanding of the joint effect of the supply chain management variables within the manufacturing entities across wide spectrum of supply chains. These studies provide credence to the use of the research design in this study.

### **3.3 Population and Sampling**

The target population of this research study was the staff of the State Department of Agriculture as well as service providers (Suppliers) contracted by the Department. The sampling techniques used for this study was stratified, purposive and simple random sampling. Stratified sampling was used to delineate the target population into the two main strata of Government employees and service providers. This ensured representation across the two main players involved in the supply chain within the Department of Agriculture. A sample of Secondary units were then selected within these primary units using both purposive and simple random sampling.

Purposive sampling was used to select staff of the Department of Agriculture. This ensured that only staff involved in the supply value chain were targeted and represented. It assisted to enable the researcher obtain relevant information on the supply chain risks and the mitigating strategies to be implemented by the staff involved in the various phases or processes of the supply chain.

These included staff drawn from the supply chain management unit, Finance, administration and Department of Agriculture project managers and Heads of Department. A total of 18 staff were selected.

Simple random sampling was used to select the service providers (Suppliers) from the service provider's database at the Department of Agriculture. Stanley and Gregory (2001) indicate that a sample size of at least 10% of the population is generally acceptable. Other scholars who have also used a similar percentage of sample size include Ombui *et al.*, (2012) in their study on performance of employees in research institutions in Kenya and Awino (2007) in his empirical investigation of supply chain management in large private manufacturing firms in Kenya. In this study given that the population of the suppliers is 362, a 10% sample was selected:

$$n = 10\% \text{ of } 362 = 36.$$

The total sample for the study constitutes:

$$n = n_1 + n_2$$

*Where*

$n$  = sample of the research study

$n_1$  = sample of suppliers

$n_2$  = sample of department staff

$$\begin{aligned} n &= 36 + 18 \\ &= 54 \end{aligned}$$

The total sample used for this research study is 54 respondents.

### **3.4 Data Collection Methods and Instruments**

The framework for data collection is presented in Figure 3 in Appendix III. Secondary and primary data was collected for both qualitative and quantitative analysis. Secondary data was extracted from both published and unpublished literature including books, journals, project reports, Government Development Plans and among others. It complimented primary data sources by providing the theoretical framework for the study as well as inform the interpretation of the study results. Useful information was also obtained from the Department of Agriculture in relation to policy and management systems used to the procurement of goods and services.

Primary data collection involved key informant interviews and sought to get information on policy prescripts, institutional frameworks, challenges and best practice approaches to the delivery of goods and services within the public sector. The key informants were purposively drawn from the Department of Agriculture.

A structured questionnaire with likert-type questions was developed and used for this study. The questionnaire contained information relevant to the study. It was then be pre-tested with an estimated 10% of the sample size as a preliminary assessment of the validity and clarity of the survey (Alreck and Settle, 1994).

The questionnaire contained both close and open ended questions to guide the interview process and align it to the study objectives (Cooper, 2009) and contain Likert-type questions. This questionnaire was administered using the interview approach. The interviews were then carried out by a small group of enumerators under the guidance and supervision of the researcher. Feedback sessions were held on a daily basis to check and address on non responses.

### **3.5 Data Analysis**

Questionnaires were coded and the data entered and analysed using Statistical Package for Social Scientists (SPSS) version 19.

Using the SPSSv19, both descriptive and statistical methods of analysis was used. The descriptive statistics involved the use of frequencies, tables and charts, while the statistical approach involved the relative importance index analysis as well as the factor analysis.

The Relative Importance Index (RII) was used to analyse the relative importance of the risk drivers within the public sector as identified by the various respondents. The method was adopted in this study among the stratified group of respondents consisting of staff from the department of Agriculture as well as the suppliers. Mathematically the RII is denoted as:

$$RII = [\sum (W1 + W2 + W3 + \dots + Wn)] / A * N$$

Where;

- W = weights given to each factor by the respondents  
(It ranges from 1 to 5 where '1' is not important and '5' is extremely important).
- A = highest weight (i.e. 5 in this case), and
- N = total number of respondents.

The RII value has a range of 0 to 1. The higher the value of the RII, the more important the factor identified.

Factor analysis was used by using the Principal component analysis (PCA) as a statistical technique that transformed a number of correlated variables into a (smaller) number of uncorrelated variables with minimum loss of information (Manly, 2005). According to Rao (1964), PCA is the most successful method under the factor analysis approach. Other authors that have used PCA for similar studies include Nzuve (2012) who used PCA to analyze the implementation of E-procurement in private hospitals in Kenya and Awino and Kariuki (2012) used PCA to investigate the factors that influence strategy and performance of private firms in Kenya.

## CHAPTER IV

### DATA ANALYSIS, RESULTS AND DISCUSSION

#### 4.1 Introduction

Chapter four presents the findings of the research undertaken during the period of August 2014. The chapter presents and interprets the response rates, reliability tests, summary statistics as well as the statistical findings of the relative importance index and the factor analysis. The results are presented in tables, figures and charts.

#### 4.2 Response Rates

The results of the response rates of this study are presented in Table 4.1 below. According to Rea and Parker (1997), the survey response rate is an important indicator of survey quality. The higher response rates assure more accurate survey results. In this study the targeted sample was 54 respondents distributed as, 18 respondents from the Department of Agriculture and 36 respondents representing 10% of the sample of registered suppliers in the Department of Agriculture database. The total number of questionnaires that were successfully completed was 47 representing an estimated 87% response rate. This represented the full sample of 18 staff from the Department of Agriculture which represented a 100% response rate and 29 suppliers who represented an 80.50% response rate. An estimated 87% overall response rate is considered adequate representative of the target population (Hamilton, 2003).

**Table 4.1** Survey response rates

<b>Respondents</b>	<b>Target sample</b>		<b>Response rate (%)</b>
	<b>count</b>	<b>Actual sample count</b>	
Department staff	18	18	100.00
Suppliers	36	29	80.50
Total	54	47	87.00

*(Source: Field survey, 2014)*

### 4.3 Data Reliability Index

According to Cronbach (1951), when conducting research with multiple item scales, it is appropriate to compute a coefficient alpha ( $\alpha$ ) values to estimate the reliability of scale responses. The coefficient  $\alpha$  value is used to test for internal consistency and reliability of a sample of respondents. The coefficient  $\alpha$  value should generally be greater than 0.69, with values between 0.8 and 0.9 considered ideal. Hogan, Benjamin and Brezinski (2000) note that cronbach's coefficient alpha is the most frequently reported reliability index. The data used in this study was collected independently from the staff and the suppliers to the Department of Agriculture. It is expected that the respondents will respond based on their individual experiences and views to supply chain risks within the department. This may differ from respondent to respondent. Using SPSS, the cronbach alpha value was 0.720 was computed (refer to result in table 4.2), which shows a good consistency in the research data. Cronbach alpha lies between 0 and 1, with a value greater than or equal to 0.6 considered acceptable (George and Mallery, 2003).

**Table 4.2: Reliability statistics**

<b>Respondents</b>	<b>Cronbach's alpha</b>	<b>Sample size (n)</b>
Staff of the Department of Agriculture	0.717	18
Suppliers	0.632	29
Overall	0.720	47

*(Source: Field survey, 2014)*

### 4.4 Summary Statistics

Table 4.4 below presents the summary statistics of the respondents of the study. According to these results, the highest percentage of respondents was based in the 40-49 year old category represented 29.79% of the respondents, followed by the 30-39 year old category represented by 27.66 percent. This is an indication that most of the staff in the department and the majority of suppliers are middle aged (30-49 years old) and represent the productive group within the working class according to Cataldi (2011). This study also established that majority of the respondents were male represented by 63.83 percent of the sampled respondents compared to 36.17 percent representing the female respondents. These result support studies by Lee (2011) who noted that the supply chain sector has traditionally been male dominated, with less females

participating for a variety of reasons which include lack of income, support and access to career opportunities in the field of supply chain.

**Table 4.3 Summary statistics of respondents**

<b>Demographic characteristics</b>	<b>Categories</b>	<b>Frequency</b>	<b>Percentage</b>
Age	less than 30	8	17.02
	30-39	13	27.66
	40-49	14	29.79
	50 and above	12	25.53
Gender	Male	30	63.83
	Female	17	36.17
Education level	No schooling	-	-
	Primary	1	2.13
	Secondary	-	-
	Technical	7	14.89
	University	39	82.98
Type of respondent	Government employee	18	38.30
	Supplier	29	61.70
Section/Division	Management	8	17.02
	Administration	20	42.55
	Finance/supply chain	19	40.43
Years of experience	less than 2 years	4	8.51
	2-5 years	10	21.28
	6-10 years	17	36.17
	more than 10 years	16	34.04
Concerned about supply chain risks	Yes	42	89.36
	No	5	10.64

*(Source: Field survey, 2014)*

The study found that majority of the respondents had tertiary level of education. This was represented by 82.98 percent. This result is expected as supply chain and logistics is a specialised area that needs higher level of study. Similarly, Aghamohammadi, Bazrafshan, Naeimi and Rad (2014) found a positive correlation between education level and business in supply chain and logistics. This study further found the majority of the respondents (42.55 percent) were involved in the administrative aspect of supply chain. This includes general administration and information technology sections. This was followed by 40.43 percent of the respondents within the supply chain section either through finance, procurement or logistics. A total of 17.02 percent constituted management. This is important information because the study



sought to target respondents who are involved in the supply value chain as they would be in a better position to provide relevant responses to the courses of risks within the supply chain.

Most of the respondents had over 6 years experience in the field of supply chain. A total of 36.17 percent had 6-10 years experience while 34.04 percent had over 10 years experience. This boards well for the supply value chain as experience is positively correlated with productivity and established relationships which are vital in the value chain (Maranto and Rodgers, 1984). A total of 89.36 percent of the respondents indicated they were concerned about supply chain risks. This is important if the risks are to be addressed by both the department and the suppliers to increase efficiency and effectiveness of the supply value chain.

#### 4.5 Supply Chain Risks within the Public Sector

The study presented respondents with a number of risk drivers within various risk categories. The results of supply chain risks within the public sector are presented in Table 4.4 below. Table 4.4 presents the RII for the different risk drivers and Table 4.5 further consolidates the index for the different risk categories as envisioned by the respondents. The RII is used as the basis to rank individual risk drivers.

**Table 4.4: supply chain risks in the public sector.**

Risk categories	Risk drivers	Importance of key drivers					RII	Rank
		1	2	3	4	5		
Disruptions	Natural disasters	16	13	7	5	6	0.481	
	Labour disputes	11	14	13	5	4	0.502	
	Supplier bankruptcy	5	12	13	9	8	0.613	
	Dependency on single source of supply	5	6	11	14	11	0.685	<b>3</b>
	Inadequate capacity if supplier	6	7	9	14	11	0.672	<b>4</b>
Delays	Inflexibility of supplier	9	14	10	9	5	0.545	
	Tight delivery deadlines	2	18	13	6	8	0.600	
	Poor quality of goods and services	6	12	5	16	8	0.634	<b>10</b>
	Delays due to transportation or sourcing places	3	9	16	12	7	0.647	<b>9</b>
	Shortage of material	6	14	13	8	8	0.592	
Systems	Information infrastructure breakdown	6	12	14	6	9	0.600	
	Poor system integration or networking	4	10	17	8	8	0.626	
	No or poor E-systems or E-commerce	2	12	13	11	9	0.655	<b>8</b>
Forecasts	Inaccurate forecasts due to long lead times, seasonality, small customer base	8	8	12	12	7	0.609	
	Lack of supply chain visibility	4	11	11	16	5	0.630	
	Site accessibility	7	13	20	5	2	0.523	

Risk categories	Risk drivers	Importance of key drivers					RII	Rank
		1	2	3	4	5		
Intellectual property	Vertical integration of supply chain	14	10	19	4	0	0.455	
	Poor global sourcing and markets	2	12	19	8	6	0.617	
	Imitations	2	8	10	18	9	0.702	<b>1</b>
Procurement	Exchange rate risk	7	6	18	11	4	0.596	
	Single sourcing risk	4	5	16	13	8	0.670	<b>6</b>
	Contract duration risk	2	7	17	14	7	0.672	<b>4</b>
Receivables	Demand from clients outweighs supply	10	11	11	9	6	0.557	
	Poor financial strength of customers	6	8	16	12	5	0.609	
Inventory	Product obsolete	8	12	12	9	6	0.570	
	Inventory holding costs	5	10	13	15	4	0.613	
	Demand and supply uncertainty	1	6	19	12	9	0.694	<b>2</b>
Capacity	Cost of capacity	8	11	15	9	3	0.548	
	Capacity flexibility/wage bill	8	9	14	13	3	0.574	
	Inadequate capacity	4	19	11	8	5	0.562	
	Inadequate skills	6	13	13	10	5	0.664	<b>7</b>

(Source: Field survey, 2014)

The top ten risk drivers in order of importance were listed as: Imitations, Demand and supply uncertainty, Dependency on single source of supply, Contract duration risk, inadequate capacity of supplier, Single sourcing risk, Inadequate skills, No or poor E-systems or E-commerce, Delays due to transportation or sourcing places and Poor quality of goods and services. According to Table 4.5, the ranking of the consolidated risk drivers by risk categories shows that procurement remains the most important risk category that the Government needs to focus on in addressing supply chain risks. This encompasses exchange rate risks, single sourcing (non competitiveness), and unrealistic contract duration risk.

This is followed by systems as is evidence by the public sector not being up to date with the latest advances in technological systems within the supply chain. Similarly the public sector is plagued by information infrastructure breakdown, poor system integration especially among the various divisions involved in the supply value chain and poor or no E-systems to improve efficiency and turnaround times within the supply chain. The third ranked risk category is inventory risk category, represented by supply and demand uncertainty, inventory holding costs and obsolete product.

**Table 4.5 Ranking risk categories based on the RII**

Risk categories	RII	Ranking
Disruptions	0.591	5
Delays	0.603	4
Systems	0.627	2
Forecasts	0.587	7
Intellectual property	0.591	5
Procurement	0.646	1
Receivables	0.583	9
Inventory	0.626	3
Capacity	0.587	7

(Source: Field survey, 2014)

A further analysis of the general supply chain risks in the public sector as shown in Table 4.6 showed that supplier failure and logistical failure were ranked as having the greatest impact in-terms of supply chain risks. Both had an RII factor of 0.672.

**Table 4.6: General risk ranking in the public sector**

Risk category	Strength of supply chain risks					RII	Ranking
	1	2	3	4	5		
Supplier failure	2	9	16	10	10	0.672	1
Strategic risk	3	10	17	15	2	0.613	3
Natural disaster	12	14	10	6	4	0.496	7
Geopolitical event	4	19	7	9	8	0.591	5
Regulatory risk	2	12	15	16	1	0.609	4
Logistics failure	3	7	15	14	8	0.672	1
Intellectual property infringement	8	15	10	9	5	0.549	6

(Source: Field survey, 2014)

Supplier failure includes failure of suppliers to deliver the right goods and services at the right time at the right place, in the right quantity and sometimes right quality. Exposure to

supplier risk also exists when the public sector uses single sourcing. This results in non competitiveness and in the absence of competition, the public sector may not get value for money.

Logistical failure refers to the inability to deliver goods and services on time due to poor infrastructure and or delivery mode. While the railway has been considered as cost effective in the transportation of goods and services, the poor state of rail in Kenya means suppliers and or Government have to use alternative and in some cases more costly means of transport to ensure goods are delivered on time and in the correct state. Similarly other logistic risk encompasses delays and non performance, hijacking and theft of transit goods, liability due to loss or delays, lack of inventory and bankruptcy (Chopra and Sodhi, 2004)

The strategic risks were ranked third with an RII of 0.613. They refer to the uncertainties and untapped opportunities embedded within the strategic intent and how well they are executed within the organisation. Strategic risks impact on the core business of the organisation and while they need to be understood by all employees they are driven by management and hence are highly correlated with the type and state of leadership within the organisation (Christopher and Lee, 2004).

#### **4.6 Sources of Risk within the Supply Chain in the Public Sector**

The study sought to find out the sources of risk within the supply chain of the public sector. The respondents were asked to rank 42 sources of risk on a scale of 1 to 5 where 1 represented no problem while 5 represented a severe problem. The 42 sources of risk were subjected to principal component analysis with varimax rotation. The results are presented in Table 4.7 and Table 4.8. Table 4.7 below represents the Eigen value proportions of variance for selecting the optimal number of principal components. The correlation matrix shows that all of the estimated correlation coefficients between the sources of risk scores are less than 0.7 as articulated by Kim and Mueller (1994).

**Table 4.7: Total variance explained (eigenvalues >1)**

No.	Eigen value	Difference	Proportion variance	Cumulative
1	9.769800	5.938775	0.3238	0.3238
2	3.005847	0.206270	0.1383	0.4621
3	2.635689	0.461241	0.1146	0.5767
4	1.988981	0.253389	0.0887	0.6654
5	1.570600	0.123406	0.0719	0.7373
6	1.263706	0.043314	0.0592	0.7965
7	1.021269	0.026351	0.0243	0.8208

(Source: *Field survey analysis, 2014*)

Seven principal components (PCs) that explained 82.08% of the variance in the original scores were extracted from the covariance matrix using SPSS vs19 as reported in Table 4.7. Koutsoyiannis (1987) suggests retaining PCs that meet Kaiser’s criterion: have Eigen values of one or above, have estimated component coefficients greater than 0.3, and can be meaningfully interpreted. The Eigen values for the seven PCs are all above one (see table 4.7). Table 4.8 below shows the results of the principal components presenting the factor loading, underlying factor as well as the univariate statistics.

Table 4.8 above shows that the principal component analysis identified 7 (seven) underlying variables. These are customer risks, external risks, supplier risks, management risks, product/people risks, regulatory risks and service delivery risks. The first variable identified was customer risk represented by 4 variables. The mean range of the variables was between 3.45 and 3.025. This is an indication that the customer risks are considered moderate risks to the supply chain in the public sector. Similarly among the customer risk, of greatest concern is the loss caused by to the product quality not meeting the needs of the customer or the contracts stipulation.

The second identified principal component factor was classified as external risks. This underlying factor comprised 7 risk variables. The mean range of variables within this underlying factor was between 3.375 and 2.925. This is an indication of the moderate extent of the external risks to the public sector supply chain. Respondents identified market demand risk and political risks as of being of greater concern among the external risks facing the supply chain. Respondents were concerned about changing consumer demand preferences, and/or new product development affecting market demand. Similarly political

changes and instability may hamper public sector delivery and remain a risk to the supply chain (Olson and Wu, 2010).

**Table 4.8: Factor loadings and univariate descriptive of sources of risks**

<b>Sources of risk</b>	<b>Factor loading</b>	<b>Underlying factor</b>	<b>Mean</b>	<b>Std deviation</b>
Technical Risks	0.60	Customer risks	3.150	1.122
Quality risks	0.56		3.450	1.260
Delivery risks	0.62		3.225	1.187
Customer communication risks	0.65		3.025	0.947
Natural disaster risks	0.64	External risks	2.925	1.228
Social risks	0.60		3.100	0.982
Political risks	0.62		3.375	1.254
Policy and decree risk	0.63		3.175	1.083
Economic change risks	0.56		3.100	1.128
Market demand risks	0.57		3.300	1.018
Market supply risks	0.59		3.150	1.099
Financial risks	0.76	Management risks	3.525	1.219
Management and decision-making risks	0.70		3.225	1.074
Outsourcing risks	0.66		3.025	1.187
Strategic risks	0.60		3.200	1.091
Competitive risks	0.61		3.525	1.062
Reputational risks	0.60		3.125	1.017
No clear guideline and procedures	0.61		2.750	1.276
Non-aligned needs	0.67		2.925	1.207
Inventory risks	0.76	Product/People risk	3.100	1.150
Transport risks	0.75		3.500	0.961
Human resources risks	0.77		3.150	1.099
Intellectual property risks	0.78		3.175	1.174
Labour risks	0.75		2.675	1.328
Innovation risks	0.81		3.375	1.079
Production risks	0.74		2.775	1.050
No professionalism	0.87		2.925	1.163
Legal risk	0.89		Regulatory risks	3.150
Illegality	0.84	3.250		1.235
Purchase price risks	0.82	Supplier	3.250	1.056

<b>Sources of risk</b>	<b>Factor loading</b>	<b>Underlying factor</b>	<b>Mean</b>	<b>Std deviation</b>
Purchasing quality risks	0.67	risks	3.025	1.209
Supplier delivery risks	0.74		3.450	0.959
Supplier communication risks	0.64		2.825	0.903
Technological risks	0.60		3.400	0.900
Service standard	0.73	Service delivery risks	2.825	1.217
Service delivery	0.83		3.100	1.057
Lack of organisational flexibility	0.71		3.175	1.083
Alternative providers	0.74		3.375	1.192
Value added services	0.79		3.150	1.189
Corruption	0.00	*	4.275	1.062
No or poor E-Systems or E-commerce	0.00	*	3.575	1.010
Regulatory framework	0.00	*	3.325	1.095

*(Source: Field survey, 2014)*

*\*Variables excluded for having zero coefficient*

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Management risks were identified as the third underlying factor and encompassing 8 risk variables. The mean average ranged from 3.525 to 2.750. This is an indication that management risks were considered to boarder on moderate to high risks within the supply chain. Financial risks and competitive risks were of greater concerns among the management risks. The financial risk is caused by the capital flow between the supply chain organisations in this case the public sector and its various suppliers and service providers. While competitive risks are caused by competition among products and services, quality and costs (Ji and Chen, 2012).

The fourth underlying factor is described as product/people risks which incorporated 8 risk variables. The mean ranged from 3.500 to 2.675. The moderate to high risks is identified especially among the following risk variables; innovation risks and transport risks. The call for the public sector to improve efficiency and effectiveness through innovation is necessary in the 21<sup>st</sup> century. Research and development is a prerequisite for innovation and these have been found lacking in the public sector. Evidence suggests that public sector innovation today mostly happens through uncoordinated initiatives rather than as a result of deliberate, strategic efforts (Dröll, 2013). The transport risks incorporate transport reliability and or delayed delivery.



Regulatory risks were identified as the fifth underlying factor represented by 2 risk variables with a mean of 3.25 and 3.150. The moderate risks of legal risks and illegality remain a concern for the supply chain within the public sector. Legal risks include the possibility of loss arising from possibility of legal proceedings against the department by service providers. Similarly illegalities entail officials not following prescripts as outlined in the contracts.

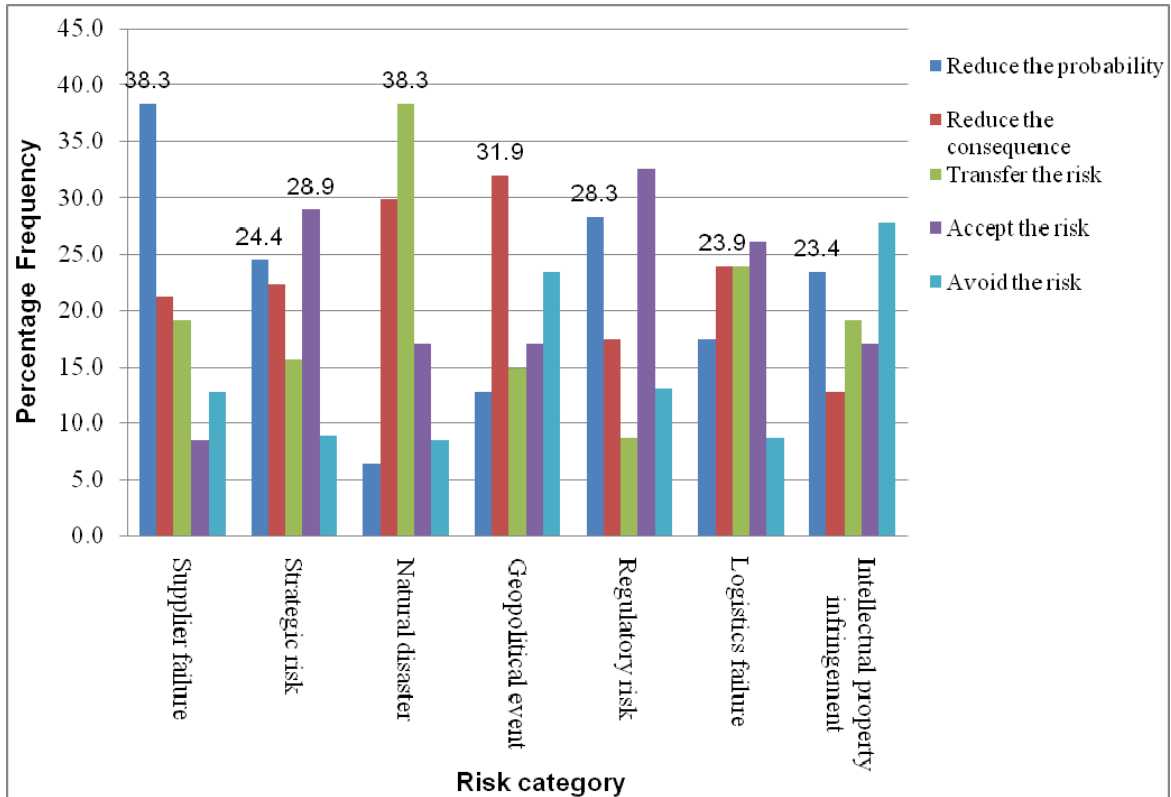
The sixth identified underlying factor is the supplier risk comprising 5 risk variables. The mean ranged from 3.450 to 2.825. This is an indication that the respondents rated this risk as moderate, with supplier delivery, risks topping the risk variables in this category. These involve risks associated with supplier delivery period, quantity and quality (Zsidisin and Ellram, 2003). The seventh principal component is labelled service delivery risk with a mean range of 3.375 and 2.825. Overall, the findings of this study are consistent with those of Kleindorfer and Saad (2005) who identified eight key risk factors in the supply chain as corporate image, liability, employee health and safety, cost reduction, regulatory compliance, community relations, customer relations and product improvement. Similarly Olson and Wu (2010) identified various internal (capacity, internal operations and information systems), and external (nature, political system, competitor and market) risks as affecting the supply chain within the sector.

#### **4.7 Supply Chain Risk Mitigation Strategies.**

There are many means available to control risks within supply chains. This involves the need to reduce the probability of risk, reduce the resulting consequence of the risk, transfer the risk, accept and manage the risk being pro-active to avoid the risk (Chopra and Sodhi, 2004). The results of the respondents risk mitigation strategies for this research are presented in Figure 4.1 below. The figure shows the key mitigation strategies identified for the different risk categories.

According to Figure 4.1, a total of 38.3 percent of the respondents stated that supplier risk could be mitigated mainly by reducing the probability. This includes reviewing contract conditions, increasing the supervision of supplier and increasing competition among suppliers in order to achieve competitive rates from suppliers. The strategic risks are at an organisational level and could be mitigated by accepting and addressing the strategic risk

according to 28.9 percent of the respondents as well as reducing the probability of the risk according to 24.4 percent of the respondents. Part of the strategic risk mitigation strategy of accepting and reducing the risk probability includes, implementing quality assurance throughout the supply chain processes, regularly analysing the project environment and having partnering and teaming agreements. Strategic risks could also be mitigated through management of the risk using existing procedures.



**Figure 4.1: Risk mitigation strategies**

(Source: Field survey, 2014)

A total of 38.3 percent of the respondents conceded that to manage natural disasters, transferring the risk would be the most appropriate mitigation strategy. It is important to note that most natural disasters are unforeseen and hence insuring against such risks could cushion the Department of Agriculture against astronomical costs associated with natural disaster preparedness and response. These findings support research by Amaral *et al.*, (2006) who recommended outsourcing as a risk transferring strategy. A total of 29.8 percent further felt the natural disasters could be mitigated by reducing the consequence of the risk. This includes having disaster management plans and strategies in place to be able to

promptly attend to a disaster situation in order to cushion the causalities or extent of damage (Greiving, 2006)

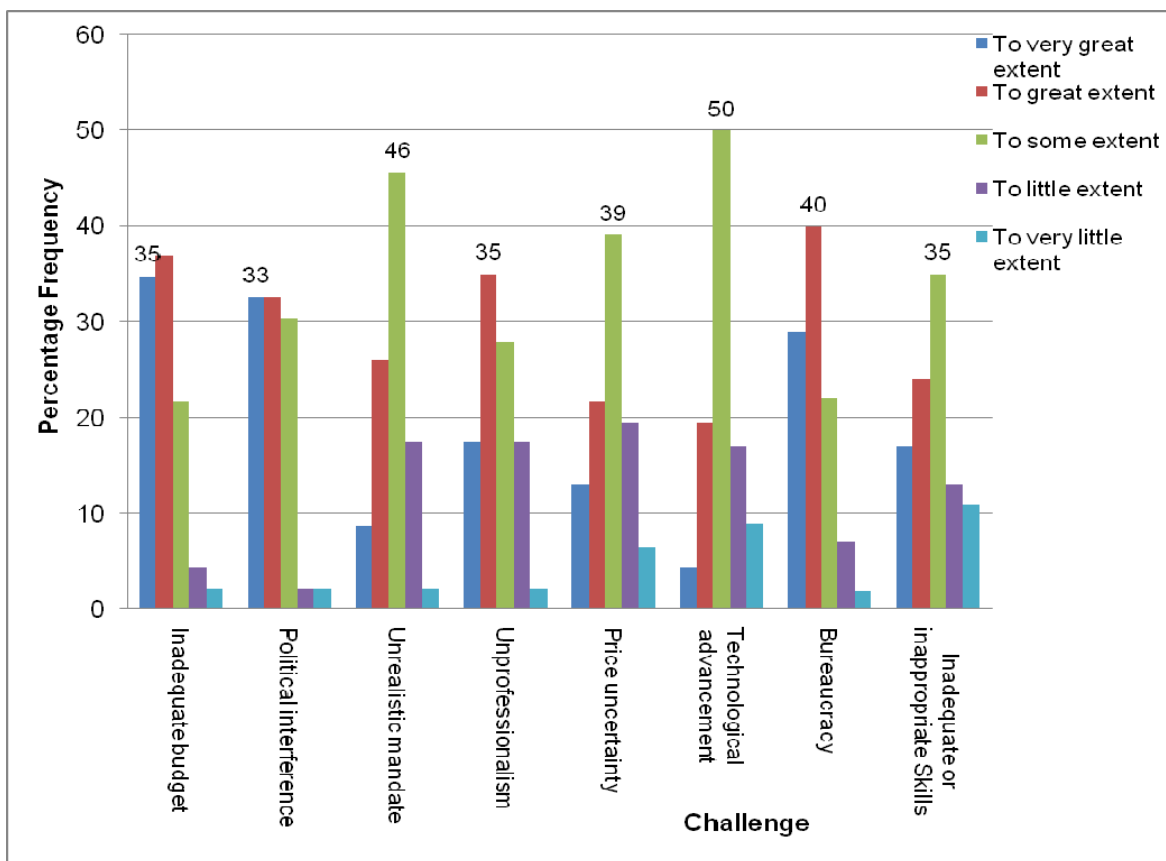
Geopolitical risks are a combination of geographic and political factors influencing the supply chain. Geopolitical risks impact on service delivery and affect investors' potential to invest in the country. Geopolitical risks could be mitigated through reducing the consequences of the risk. This was noted by 31.9 percent of the respondents. This includes having watertight processes in place to address geopolitical risks. The consequence of the risk can also be mitigated by hiring staff that are independent and impartial and dealing with honest suppliers or worse still delisting suppliers who try to win tenders through corrupting Government officials.

Regulatory risks refer to the laws and regulations that govern supply chain risks. These can impact on the cost of doing business in the country and do not promote accountability and transparency. A total of 32.6% of the respondents alluded to the need to reduce the regulatory risk through ensuring all policies, acts and laws governing the supply value chain are readily available and cohesive to avoid contradictions. These should be reviewed when there is change in policy or changes in the regulatory environment. A total of 26.1 percent of the respondents responded that logistical failure could be mitigated through accepting the risk and managing it through existing procedures. Contingency plans are vital to cushion logistical challenges as well as, incorporating an estimated 10 percent in the costing of goods and services to cater for unforeseen circumstances. This will be handy during logistical failure which leads to increased costs.

Lastly the Intellectual property has continued to receive global attention and has serious ramification which could be costly in the event of intellectual infringement. It is for this reason than 27.7 percent of the respondents, reported that this risk can be mitigated through avoidance of the risk. Avoiding the risk is critical because intellectual property risks have legal ramifications which could be costly to the organisation. Hence it is important for staff to understand intellectual property rights and ensure these are embedded within the supply chain to avoid illegalities in the procurement of goods and services. Clearly outlined intellectual property policies will prohibit intellectual infringement and encourage the sourcing of goods and services from holders of the intellectual property, reviewing contract conditions to ensure intellectual property is honoured and increasing supervision along the value chain to identify and address intellectual infringement.

#### 4.8 Challenges to Risk Mitigation

The following factors were identified as key challenges to mitigate against risks: inadequate budget, political interference, unrealistic mandate, unprofessionalism, price uncertainty, technological advancement, bureaucracy and inadequate skills. Respondents were asked to classify to what extent these challenges affected risk mitigation with the public sector. The results are presented in Figure 4.2 below.



**Figure 4.2 Challenges to risk mitigation**

(Source: Field survey, 2014)

A total of 37 per cent of the respondents noted that inadequate budget was to a very great extent a hindrance to mitigating public sector risks. This can be explained by the fact that budgetary constraints continue to plague the public sector with a bulk of money going to compensation of employees and limited available for operational purposes which include mitigating supply chain risks. These results point at the need for the Government to prioritise risk mitigation within the supply chain in its annual budgetary allocation. A total of 34 percent of the respondents noted that political interference was a hindrance to a very

great extent, to mitigating supply chain risks. This political risks stemmed from political heads in some instances interfering with procurement procedures, flouting of regulations and request for political favours. This exposes the system to interference and accountability and the flouting of policies.

A total of 46 percent of the respondents noted that unrealistic mandate remain a challenge to some extent. This is in instances where the demand outstrips supply and in many instances public servants not understanding the mandate of the public sector. A total of 35 percent of the respondents noted that unprofessionalism continued to plague the public sector to a great extent. This has the result of hampering effective and efficient delivery of goods and services hence affecting overall performance of the supply chain and exposing it to risks. A total of 39 percent noted that price uncertainty was a challenge to some extent. In the event of the scarce skill or good and services, the public sector remains a price taker and may not be in a position to negotiate.

A total of 50 percent of the respondents noted that technological advancement was a challenge to some extent. This includes the need for the public sector to keep abreast and in line with technological advances example the implementation of E-procurement, which Kenya is at the moment trying to implement. The public sector has continued to lag behind the private sector in relation to keeping up with technological advances. A total of 40 percent of the respondents noted that bureaucracy was a challenge to a great extend. Suppliers complained about the red tape and bureaucratic processes that affected service delivery. Lastly 35 percent noted that inadequate skills were a challenge to some extent. The public sector continues to compete with the private sector for critical skills and this affects delivery.

## **CHAPTER V**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

Chapter five is a culmination of the research report, presenting the summary of the findings, the research conclusions and recommendations. The summary of the findings are a brief chronological assessment from the objectives to the key findings. The research conclusions seek to draw from the findings the overall outcome and the recommendations are aimed at presenting a course of action and areas for future research.

#### **5.2 Summary of the Research**

The aim of this research study was overall to enhance public sector effectiveness by ensuring equity, service delivery and overall economic growth through efficient supply chain management system. Specifically the research objectives were: (i) to identify supply chain risks within the public sector in Kenya with special reference to the Department of Agriculture, (ii) to establish the challenges faced in mitigating supply chain risks within the public and (iii) to establish measures to mitigate key supply chain risks. The study area was the State Department of Agriculture and the study population included staff included in the supply chain as well as the suppliers (service providers) to the department. Using two-stage stratified sampling, a total of 54 respondents was sampled consisting of 18 staff members and 36 suppliers. A structured questionnaire was used to collect the data using interview method. The response rate of 78% was achieved with the reliability index being 0.743.

The summary statistics found that over 57% of the respondents were middle aged between the ages of 30-49 years old, 64% were male and over 85% had university level of education. Most of the respondents representing 36% had over 6 years of working experience with 88% being concerned about supply chain risks in the public sector. The relative Importance Index was used to rank the top ten risk drivers in order of importance as: imitations, demand and supply uncertainty, contract duration risk, dependency on single source of supply, inadequate capacity of supplier, single sourcing risk, Inadequate skills, poor quality of goods and services, no or poor e-systems or e-commerce, delays due to transportation or sourcing places. The ranking of the broader risk categories using the RII identified procurement risk as critical and needing Government attention to address exchange rate risks, single sourcing (non competitiveness), and unrealistic contract duration risk.

The principal component analysis with varimax rotation was used to further analyse 42 sources of risk and identify the underlying factors. Using SPSS vs19, seven principal components (PCs) that explained 82.06% of the variance in the original scores were extracted from the covariance matrix. The Eigen values for the seven PCs are all above one. The seven identified underlying factors were customer risk, external risks, management risks, product/people risks, regulatory risks, supplier risks and service delivery risks. These results are consistent with findings by Zsidisin and Ellram, (2003) and Olson and Wu (2010).

The risk mitigation strategies were also identified for the following risks; supplier risks, strategic risks, natural disasters, geopolitical risks, regulatory risks, logistical risks, and intellectual property risks. Most of the respondents noted that this risk could be mitigated by reducing the consequence of the risk or transferring the risk. The challenges to risk mitigation were identified as inadequate budget, political interference, unrealistic mandate, unprofessionalism, price uncertainty, technological advancement, bureaucracy and inadequate skills.

### **5.3 Conclusions and Recommendations**

The following conclusions were made based on the summary of findings above. Supply chain risks remain a key concern for decision makers in the public sector. The classification and management of risk is a fundamental ingredient to effective management and governance in the public sector. Decision makers have a responsibility to act in the best interest of all stakeholders by identifying, evaluating and responding to risk whether internal or external to the entity. Risk management strategies and controls need to be put in place to address such risks. However it is important to note that while the executive is held to account for managing risk, the responsibility actually resides with staff at all levels of the entity. This entails adopting a risk based approach, internal controls and assessment of their effectiveness. This strategy should be integrated within the strategic, governance and management processes of the entity and should include the wider aspects of internal control, not just those related to financial reporting.

#### **5.4 Research Limitations**

The sample that was taken cannot be assumed to represent the entire population of Government Ministries in Kenya. However it is expected that the total sample of respondents across the respondent categories of service providers, Ministry staff and managers suffices in making reasonable conclusions.

Due to limitation of resources (time and money) the study considered the Department of Agriculture Head office in Nairobi, Kenya. It is expected that the information provided will improve the functioning of the broader Departments within Government.

The respondents contacted included service providers, Departmental staff and managers. The service providers were mainly drawn from those within the database in the department. A large number of service providers who are not on the database were hence excluded. It is expected that the service providers on the database are a representative sample.

The study assumed that the respondents were not biased in their responses and provided objective answers to the questions.

#### **5.5 Suggestions for Further Research**

This study focussed on supply chains in the public sector with special reference to the State Department of Agriculture. Future studies can expand the scope to do a comparative analysis of public vs private sector supply chain to identify if a parallel can be drawn and where efficiencies can be improved and lessons learned. Secondly since the study focussed on identifying the supply chain risks and mitigation approaches, this research recommends further research in the area of understanding the impact of supply chain risks on the performance of the public sector. The relationship between organisational strategy, risk and the implications for supply chain management needs of further exploration.



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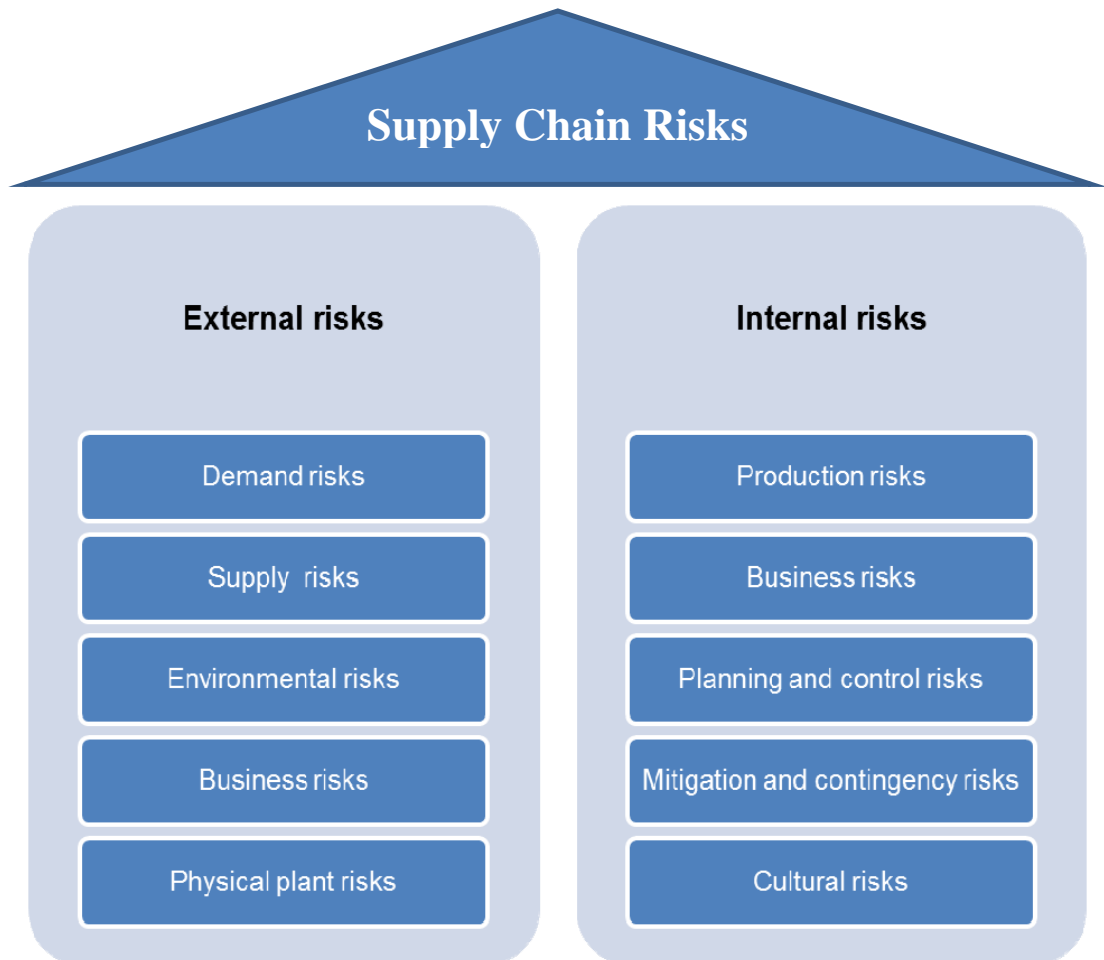
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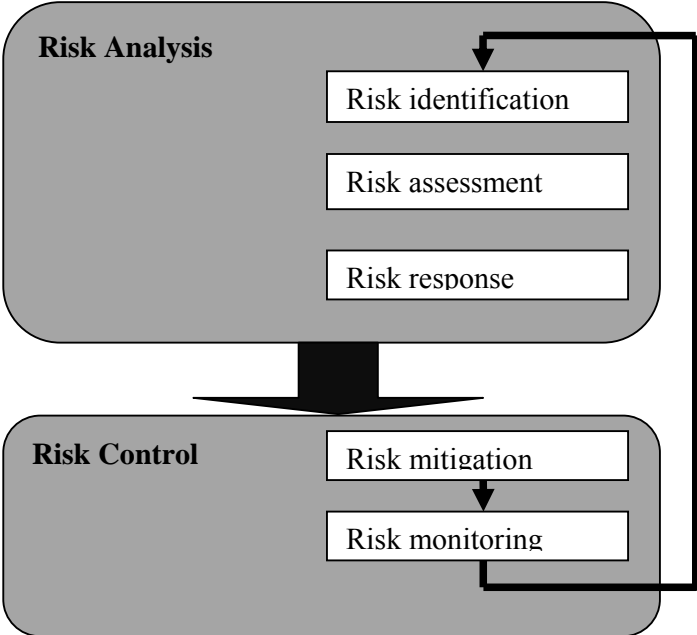
## Appendix I: Supply Chain Risks



**Figure 1: Supply Chain Risks**

*(Source: Rao and Goldsby, 2009. Accessed 21-05-2014)*

**Appendix II: Supply Chain Management Process**

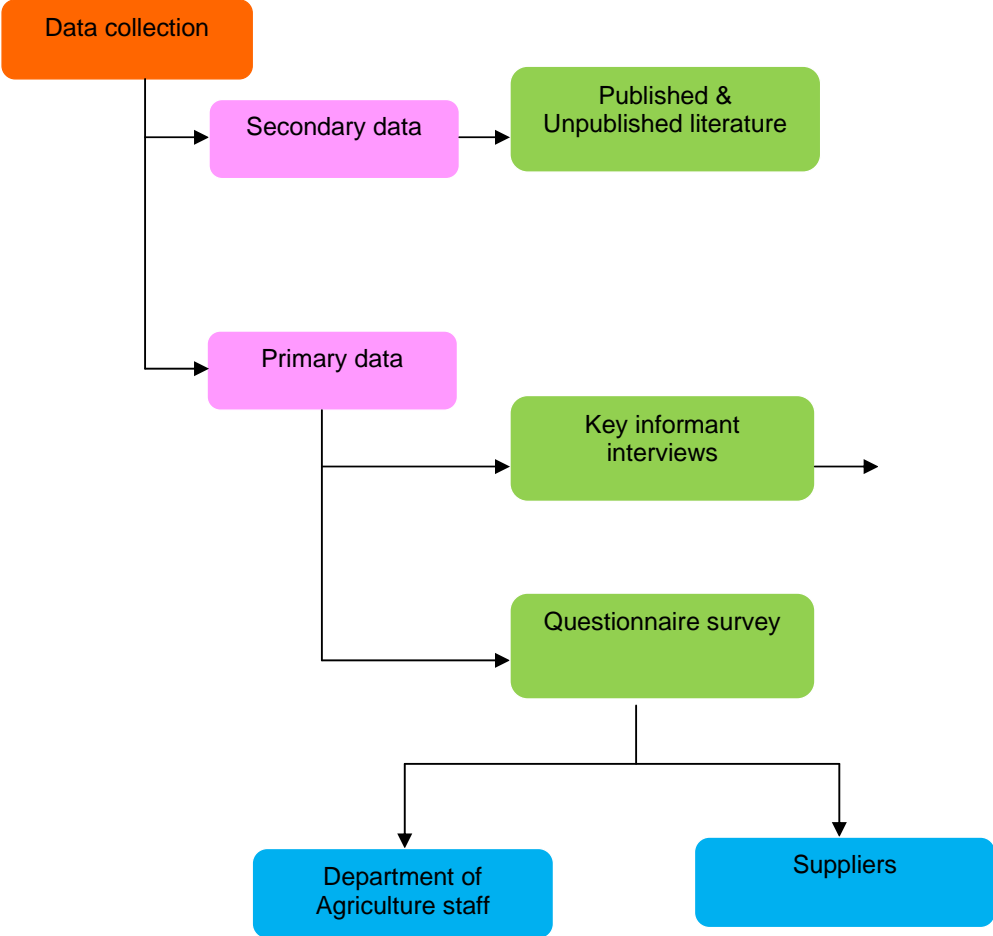


**Figure 2: Supply chain risk management process**

*(Source: Musa, 2013. Accessed 24-06-2014)*



**Appendix III: Data Collection Framework**



**Figure 3: The Data Collection Methodology**  
(Source: Researcher, 2014)

**APPENDIX IV: QUESTIONNAIRE**



**University of Nairobi**  
Towards World Class Excellence

**MANAGING SUPPLY CHAIN RISKS WITHIN THE PUBLIC  
SECTOR: THE CASE OF THE MINISTRY OF AGRICULTURE,  
KENYA**

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Masters in Business Administration: Survey Questionnaire

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*The overall goal of this research project is to enhance public sector effectiveness by ensuring equity, service delivery and overall economic growth through efficient supply chain management system. **There are no right or wrong answer***

**YOUR OPINION MATTERS**

<b>Background information</b> <i>( Please answer the following questions )</i>	
Date of Interview	
Name of Enumerator	
Name of respondent	
Telephone Number	
Physical address	
Respondent ID	

## 1. Socio-demographic Characteristics

<i>(Please answer questions 1.1-1.9. Indicate with an X the selected option)</i>			<b>Code</b>
1.1	Age of the respondent	less than 30	1
		30-39	2
		40-49	3
		50 and above	4
1.2	Gender	Male	1
		Female	2
1.3	Highest Education level	No schooling	1
		Primary	2
		Secondary	3
		Technical	4
		University	5
		Other (Specify).....	6
1.4	Type of respondent	Government employee	1
		Supplier	2
1.5	Which division/department/section do you head?..... .....		
1.6	What is your position in the organisation/department?..... .....		
1.7	Number of years working experience	less than 2 years	1
		2-5 years	2
		6-10 years	3
		more than 10 years	4
1.8	What is your field of specialisation ?..... .....		
1.9	Is your organisation/business concerned about supply chain risks? Yes/No .....		

## Objective 1

### 2. Risk Drivers

Please rate on a scale of 1-5 which are the key risk drivers that affect the supply chain 1-(not a key risk driver) and 5-(a key risk driver) within the public sector.

Risk category	Risk drivers	1	2	3	4	5
Disruptions	Natural disasters					
	Labour disputes					
	Supplier bankruptcy					
	Dependency on single source of supply					
	Inadequate capacity if supplier					
Delays	Inflexibility of supplier					
	Tight delivery deadlines					
	Poor quality of goods and services					
	Delays due to type of transportation mode or sourcing places					
	Shortage of material					
Systems	Information infrastructure breakdown					
	Poor system integration or networking					
	No or poor E-systems or E-commerce					
Forecasts	Inaccurate forecasts due to long lead times, seasonality, small customer base					
	Lack of supply chain visibility					
	Site accessibility					
Intellectual property	Vertical integration of supply chain					
	Poor global sourcing and markets					
	Imitations					
Procurement	Exchange rate risk					
	Single sourcing risk					
	Contract duration risk					
Receivables	Demand from clients outweighs supply					
	Poor financial strength of customers					
Inventory	Product obsolete					
	Inventory holding costs					
	Demand and supply uncertainty					
Capacity	Cost of capacity					
	Capacity flexibility/wage bill					
	Inadequate capacity					
	Inadequate skills					

**Objective 1**

**3. Risk factors**

**In your opinion, what is the strength in the following supply chain risks within the public sector indicating between 1-5. Where 1 (not a major risk) while 5(a major risk)**

<b>Risk category</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Supplier failure					
Strategic risk					
Natural disaster					
Geopolitical event					
Regulatory risk					
Logistics failure					
Intellectual property infringement					
Other (Specify).....					

## Objective 1

### 4. Risk factors affecting the supply chain of the public sector

Rank the following *Sources of risk* from 1 to 5 where 1 is no problem and 5 is a severe problem (tick where appropriate)

No.	Source of risk	1	2	3	4	5
1	Natural disaster risks: the supply chain risks influenced by the natural calamities and environmental disasters, which are unpredictable but have serious influences.					
2	Social risks: risk such as theft, malicious damage, fraud and lack of safety nets for local enterprises.					
3	Political risks: the risk sources contain domestic and international politics stabilities.					
4	Policy and decree risks: uncertainty of the laws and regulations which are passed by the state or local governments, such as the incentive / subsidy policy, environmental standard setting.					
5	Strategic risks: Lack of clear strategic direction or buy-in into organisational strategy and culture					
6	Economic change risks: the apparel supply chain risk is caused by the adjustments of bank reserve ratio or interest rate, exchange rate changes, stock market volatility, inflation or deflation.					
7	Market demand risks: demand risks including customer demand preferences, the number of customers, seasonal variation; the risk of new product development.					
8	Market supply risks: supply not able to meet the demand or not as per requested.					
9	Technical Risks: the technical difficulty of undertaking orders, developing customer patterns and various technical questions during production.					
10	Innovation risks: Risks associated with rapid technological advancement or obsolete technology					
11	Quality risks: the risk of loss due to the product quality doesn't meet the requirements of customers or contracts, or cannot meet the normal usage or national standards.					

No.	Source of risk	1	2	3	4	5
12	Delivery risks: including the risk of delivery period and delivery quantity to customers.					
13	Customer communication risks: the risks are caused by information distortion or information interruption in the process of information transmission between enterprises and customers.					
14	Purchase price risks: the risks are caused by price fluctuation of the procurement goods, during the period that after signing the contract with customer but before the implementation of procurement.					
15	Purchasing quality risks: the possibility that the fabrics purchased from the suppliers can't satisfy the customers or enterprises' quality requirements.					
16	Supplier delivery risks: the risk of supplier delivery period, delivery quantity and quality					
17	Supplier communication risks: the risks are caused by information distortion or information interruption in the process of information transmission between enterprises and their suppliers.					
18	Competitive risks: the risk is caused by the competition of products and services, quality and cost, management ability and access to resources among enterprises.					
19	Inventory risks: fabric and accessory material, finished products, semi-finished products and some spare parts, all of which increase the financial burden and storage risk.					
20	Outsourcing risks: the risk is caused by outsourcing business, as design, processing and testing.					
21	Transport risks: delayed or advance delivery, untimely transportation document or delivery order risks, long-time stock preparation, inappropriate mode of transport, and the reliability of deliver.					



No.	Source of risk	1	2	3	4	5
22	Management and decision-making risks: the interests of some enterprises are influenced when the management or decision-making conflicts emerging among supply chain enterprises.					
23	Human resources risks: the risk is caused by staff skill levels and losing of workers.					
24	Financial risks: the risk is caused by capital flows between the supply chain organizations.					
25	Intellectual property risks: risks associated with imitations and fake products supplied or purchased					
26	Labour risks: associated with labour strikes or go slows					
27	Legal risk: Risk due to legal actions against the supplier or the Department					
28	Illegality: Risk due to failure to follow laid down internal procedure					
29	Technological risks: Risks associated with lack of adequate technology, lack of technical information and expertise.					
30	Reputational risks: Risks associated with poor reputation of supplier or Department					
31	Production risks: Risks due to interruption in the production cycle					
32	Clear guideline and procedures manual are lacking to guide the supply chain processes internally and externally					
33	Professionalism: lack of professionalism in dealing with suppliers or staff					

34	Identify with your needs: purchases of goods and services not aligned to the needs					
35	Service standards: no standard/ uniform service charter					
<b>No.</b>	<b>Source of risk</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
36	Service delivery is inconsistent consistent across the department:					
37	Lack of organisational flexibility in accommodating special requests					
38	Alternative providers: risks associated with lack of diversity in suppliers to a particular goods and services					
39	Value added services e.g. training: risks associated with lack of value added service on the operation and maintenance of the goods and services					
40	Corruption : risks associated with corruption and collusion between suppliers and Department staff or politicians					
41	No or poor E-Systems or E-commerce within the supply chain system					
42	Regulatory framework a hindrance to the delivery of goods and services					
43	Other					

## Objective 2

### 5. Risk Mitigation

Please indicate with an **X** the risk mitigation strategies you would recommend for the various risk categories

Risk category	Mitigation strategy					
	Reduce the probability (review contract conditions)	Reduce the consequence (Contingency planning)	Transfer the risk (Risk sharing agreements /insurance)	Accept the risk ((Management of the risk using existing procedures)	Avoid the risk (Cease the activity affected by the risk)	Other (Specify)
Supplier failure						
Strategic risk						
Natural disaster						
Geopolitical event						
Regulatory risk						
Logistics failure						
Intellectual property infringement						
Other						

**Note:** For the purpose of the enumerator the examples of the mitigation strategies are explained below. A respondent can choose more than one risk strategy to be applied to a particular risk factor.

## Objective 3

### 6. Challenges to risk mitigation

To what extent do you consider the following factors as challenges to mitigating risks within the public sector (Please indicate with an **X** the appropriate response).

No.	Challenge	To very great extent	To great extent	To some extent	To little extent	To very little extent
1.	Inadequate budget					
2.	Political interference					
3.	Unrealistic mandate					
4.	Unprofessionalism					
5.	Price uncertainty					
6.	Technological advancement					
7.	Bureaucracy					
8.	Inadequate or inappropriate Skills					
9.	Other (Specify)..... ..... .....					

*If you feel the need to comment on this research in general or on this questionnaire in particular (maybe some questions were not clear to you or some questions were too difficult), Please feel free to comment in the space provided below.*

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**ONCE AGAIN THANK YOU VERY MUCH FOR YOUR PARTICIPATION IN THIS QUESTIONNAIRE**