SUPPLY CHAIN SECURITY MANAGEMENT AND SUPPLY CHAIN PERFORMANCE OF MINISTRY OF ROADS AND TRANSPORT CONSTRUCTION AGENCIES IN KENYA

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Supply Chain Security Management and Supply Chain Performance of Ministry of Roads and Transport Construction Agencies in Kenya

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DECLARATION

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

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DEDICATION

I dedicate this research project to my wife Lillian Z. Moss Okubo, beloved parents, children Brandon, Blaise, Bianca, Malickey, Bildad, John and other family members for their sacrifice, commitment, unending support and encouragement.

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ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank Group
ANOVA	Analysis of Variance
ANTP	National Private Transport Association
ASEAN	Association of Southeast Asian Nations
CBE	College of Business and Economics
CVI	Content Validity Index
ERP	Enterprise resource planning
FBI	Federal Bureau of Investigation
FCPA	Foreign Corrupt Practice Act
GDP	Gross Domestic Product
ICT	Information Communication Technology
KERRA	Kenya Rural Roads Authority
KURA	Kenya Urban Roads Authority
LVAC	Local Value-Added Content
MDG	Millennium Development Goals
MRT	Ministry of Roads and Transport
NCSC	National Cargo Security Council

OEE	Overall Equipment Effectiveness,
OOE	Overall Operations Effectiveness
RBV	Resource-Based View
RECs	Regional Economic Communities
RFP	Request for Proposal
SC	Supply Chain
SCI	Supply Chain Incorporation
SCM	Supply Chain Management
SCR	Supply Chain Risk
TAM	Technological Acceptance Model
TEEP	Total Effective Equipment Performance
UR	University of Rwanda
US	United States
USA	United States of America
WTO	World Trade Organization

DEFINITION OF OPERATIONAL TERMS

Facility Security Management is a professional management discipline focused on the efficient and effective delivery of logistics and other support services related to real property and buildings. It encompasses multiple disciplines to ensure functionality, comfort, safety and efficiency of the built environment by integrating people, place, process and technology (Wang, 2022).

Freight Security Management is the process of efficiently and strategically moving freight across a network from its point of origin to its desired destination using various modes of transportation, intermediaries, and technologies. The process employs logistics and supply chain expertise, physical assets such as trucks, distribution centers and warehouses, and technology to move freight efficiently and cost-effectively (Wang, 2022).

Information Security Management concerns a cycle of organizational activity: the acquisition of information from one or more sources, the custodianship and the distribution of that information to those who need it, and its ultimate disposal through archiving or deletion (Oromo, & Mwangangi, 2022).

Legal Structure Refers to areas of law jurisdictions that govern the logistics and transportation sector, which provisions are made by the government in ensuring and creating a fair playground for all companies involved. Legal structures are the key guidelines put in place by the government to be followed (Ogaga, 2022).

Resource Security Management is the efficient and effective development of an organization's resources when they are needed. Such resources may

include the financial resources, inventory, human skills, production resources and natural resources (Gómez-Cedeño *et al*, 2021)

Supply Chain Performance Refers to how effective each stage of the ecommerce supply chain is in optimizing costs, reducing inefficiencies, improving speed, and meeting customer expectations. It can be measured through On-time delivery, cost control and quality assurance (Ogaga, 2022).

Supply Chain Security Management is the application of policies, procedures, and technology to protect supply chain assets from theft, damage, or terrorism and to prevent the unauthorized introduction of contraband, people into the supply chain. It focuses on the risk management of external suppliers, vendors, logistics and transportation. Its goal is to identify, analyze and mitigate the risks inherent in working with other organizations as part of a supply chain (Mwandali, 2022).

ABSTRACT

Despite the creation of KeHNA, KURA and KERRA road infrastructure projects constructed by local firms, Kenya continued to face several challenges that led to poor performance of the projects in that on average only 39.4 percent of the road infrastructure projects constructed by local firms in Kenya were completed within the budgeted cost, quality and scheduled time. This study sought to establish the influence of supply chain security management on the supply chain performance of ministry of roads and transport construction agencies in Kenya. Specifically, the study sought to establish the influence of freight security management on supply chain performance of ministry of roads and transport construction agencies in Kenya, to determine the influence of facility security management on supply chain performance of ministry of roads and transport construction agencies in Kenya, to establish the influence of information security management on supply chain performance of ministry of roads and transport construction agencies in Kenya, to evaluate the influence of resource security management on supply chain performance of ministry of roads and transport construction agencies in Kenya and to determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. The study was guided by Technological Acceptance Model (TAM), Resource Based View Theory, Contingency Theory, Human Capital Theory and Systems Theory. The research used a cross-sectional survey design. This study adopted a positivism research philosophy. The unit of analysis in this study was the three road construction agencies which are the Kenya National Highways Authority, Kenya Urban Roads Authority and Kenya Rural Roads Authority. On the other hand, the unit of observation was Procurement and Supply Chain Management employees working with the three agencies. The study mainly focused on procurement and supply chain managers as they play a critical role in providing the requisite data and information for the finalization of the research. Therefore, the target population for this study was 420 procurement and supply chain management officers. Using Mugenda and Mugenda (2022) formula, the sample size for the study was 136 procurement and supply chain Officers. Quantitative data collected was analyzed using descriptive statistical techniques which are frequencies, mean, standard deviation. Inferential statistics which include Pearson correlation and the Regression Analysis Model was used to test the relationship between study variables. To test moderating effect the study used hierarchical regression model. The significance of the model was tested at 5% level of significance. Data was analyzed using Statistical Package for Social Sciences (SPSS) software version 26. The study concluded that freight security management, facility security management, information security management and resource security management positively and significantly influence the supply chain performance of ministry of roads and transport construction agencies in Kenya. It was also concluded that legal structure has significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. Based on the findings, the study recommends that the ministry of roads and transport

construction agencies in Kenya should prioritize facility security management, information security management, resource security management, freight security management and legal structure.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Supply chains security, and more explicitly in ministry of roads and transport, is a subject that have drawn a great deal of consideration from researchers and practitioners in the recent past. This have been as a result of expansion in the quantity of regular and man-made catastrophes. The expanded crimes in robbery and forgery give stressing indications in supply chains. Business managers throughout the world have recently become exposed to the vulnerability of their supply chains to an ever-increasing range of security breaches and disruptions that affect global supply chains (Mbogo, 2022). The theory of supply chain management (SCM) is the integration of suppliers, buyers, distribution and customers in which raw materials flow from suppliers to manufacturers who assemble them into finished products and organize timely delivery into the hands of customers (O'Regan, & Ghobadian, 2022).

Recently, the development of supply chain system is until the integrated supply chain management, which may give several advantages for industries particularly humanitarian sector, such as improved delivery performance, reduction of lead-time, and reduction of inventory (raw materials, work in progress and finished products), improved flexibility, efficiency and utility, improved capacity realization and improved asset usage. Ministry of roads and transport construction agencies supply chain management is concerned with managing the efficient flow of materials, information and services and aim to facilitate road transport (O'Regan, & Ghobadian, 2022).

According to Loss and McGarrell (2022) security management on the supply chain is the use of methodology and innovations to safeguard inventory resources (items, offices, gear, information, and staff) from theft, harm, or intimidation, and to prevent the presentation of unapproved stash, individuals, or weapons of mass annihilation into the

production network. In accordance with Martin *et al.* (2022) inventory network security is now seen as a critical space in overseeing business risk. Associations are giving a lot of consideration to security by designating additional cash, time, and assets to affirm that security exists in their store network as abrupt episodes result to unmistakable and theoretical injury as far as property, items, framework, individuals, notoriety, market position, generosity and entirety (Securitex, 2022). Though most organizations are devoting accumulated resources and a focus to security efforts, very little data is accessible to corporations seeking to reduce their exposure to sudden and doubtless damaging or troubled occurrences touching their supply chains.

Supply chain security is part of supply chain risk management and aims to stop man-made attacks, like stealing, harm or destruction of product and assets (Robinson, & Pearce 2022). Therefore, the thought of supply chain security isn't an isolated plan and may be enforced across the supply chain and borders (countries, departments, competitors, customers and transportation modes), whereas awareness ought to be integrated at each stage of interaction (Vel, Creed, & Narayan, 2022). Supply chain security ought to be a high priority for corporations as a result of a breach, at intervals the system may harm or disrupt operations. Vulnerabilities of supply chains may lead to extra prices, inefficient delivery schedules and a loss of belongings. Delivering products that are tampered with or are unauthorized can be harmful to customers and result in unwanted lawsuits. Security management systems will facilitate supply chains from physical and cyber threats. Physical threats include risks with internal and external sources, like stealing, sabotage and terrorist act, whereas cyber threats vulnerabilities in IT and package systems include malware attacks, piracy and unauthorized system access. Whereas threats cannot be eliminated fully, supply chain security will work towards achieving a safer, economical movement of products that may recover quickly from disruptions. Multiple forms of responses and actions are undertaken by completely different governmental organizations, international organizations and businesses to reinforce humanitarian supply chain security. These reactions vary from country specific operational laws to world research programs. As an example, methods associated with

contract management, quality management, risk management, network reengineering and create or obtain selections are a unit wide acknowledge by researchers as techniques to enhance performance of supply chains whereas minimizing prices and negative environmental impacts (Badenhorst-Weiss, & Waugh, 2022). Likewise, adding production lines to quickly shift volume will facilitate corporations to take care of their competitive edge up the marketplace (Caplice, & Sheffi, 2022).

The recent concerns on security in the road and transport supply chains have led to the introduction of new security initiatives, standards and measures to such an extent that they have become an integral part of supply chain management. Although management in many organizations are concerned about SCS, they may have challenges dedicating resources to implement or bolster SCS initiatives. This is understandable because of the heavy cost implication involved in developing or enhancing SCS. As a consequence, supply chain security is now a fundamental requirement in an organization and should be coordinated with supply chain management (Securitex, 2022). Security measures often help organizations to protect organizations against unexpected supply incidents and hence work as detection system for supply chain players in case of a disaster. O'Regan, and Ghobadian, (2022) distinguished the security measures into four categories; cargo/freight security management, facility security management and information security management which form the independent variables of this study. The fourth category is resource security management which is merged with legal structure to form the variable organizational culture which supposedly moderates the relationship between supply chain security management and organizational performance.

1.1.1 Global Perspective on Supply Chain Security Management

According to Adams (2015), an average company probably loses around 12 percent of its asset yearly somewhere along the supply chain in the USA. Likewise, the Federal Bureau of Investigation (FBI) in US have reported haul theft in the range between $10 and $30 billion per year (Anderson, 2022). The European Parliament reported theft of lorries and consignments in Europe for a value of about €8.2 billion yearly (European

Parliament, 2022). According to other statistical reports, in Europe counterfeited and pirated items amounted to $176 billion in 2007 (Rodwell *et al*., 2022). According to another report from the European Commission, in 2006, almost 3 million of pharmaceutical products were found to be counterfeits (EU Commission, 2008). These figures may be higher, since logistics operators have a tendency to hide the problem to their customers (Ekwall *et al*., 2022). These are alarming quantities of losses that should worry any manager.

In Latin America and the Caribbean, logistics security is an increasingly important issue and is vital to the growth of the region due to the potentially damaging social and economic effects of a break in the logistics chain. In the case of the countries of Central America, the issue is even more strategic given the rising cases of crime affecting logistics chains and driving up the logistics-related costs of doing business. The region puts over US$ 6.5 billion per year into combating insecurity and violence (SICA, 2021). Moreover, the lack of security have pernicious effects on the economy, driving down competitiveness, reducing national and foreign investment, and dampening employment and productivity by making consumer products more costly due to the extra costs involved (Caplice, & Sheffi, 2022).

Logistics security also have a major regional component. The growing interdependence of logistics networks fortifies the need to coordinate specific actions at the regional level to deal with organized crime and international terrorism. The National Cargo Security Council (NCSC) estimates that losses from unreported theft and related indirect costs comes to between US$ 20 billion and US$ 60 billion annually in the United States. For its part, the National Private Transport Association (ANTP), also in Mexico, estimates that between 15% and 20% of the money, that companies spend on logistics is for investments in security, but these investments often fail to produce visible upgrades. In Europe, supply chain actors interested in preventing and mitigating the consequences of antagonistic threats as theft, terrorism and counterfeiting are joining voluntary certification programs, business certifications. The most important organization in

Europe, working in the field of logistics and transport security, is the Transported Asset Protection Association (TAPA) (Honke & Frenandez, 2022).

1.1.2 Regional Perspective on Supply Chain Security Management

Various literature (Fadahunsi & Rosa, 2020; Mamman, 2021; Ogunbodede, Ilesanmi, & Olurankinse, 2022) opined that movements (traffic) on legal and illegal routes had increased levels of insecurity in some towns in Northeast and that resulting in unsafe transport. The growth of insecurity along these borders have been a major concern for trade. This trend have resulted to reduced trade flows across borders and leading countries to readjust, reallocate spending to make room for security as the case in Nigeria with the multinational force along the northeast region. Most trade hubs in Maiduguri (northeast) and the far North (Kano, Sokoto) have been affected.

Types of terrains in the Northeast regions have affected transportation in various locations. Gains in Adamawa and Borno location is eroded due to increased insurgency, which connected to porous borders in the region. Increased conditions in the sub-Saharan region had caused increased inflow of migrations in the region – from the Libyan conflicts, insurgency in Mali and most of North Africa, famine in Chad and Niger and other regions. Armed conflicts – al-Qaida, Boko Haram and other conflicts in the region, have affected road transport. Road transport is the most pervasive of all transport modes in Africa and is central to the socio-economic growth and development of all countries in the region (Pinard, 2021).

The security or lack thereof in Africa can have various effects on the markets in the countries that are doing business with them. As a result of these attacks, shipping companies are facing increased insurance and security costs, which have to be passed on to customers in some form. There is little evidence of documented literature or researches on cargo security and related challenges in Tanzania. Those studies such as Honke and Frenandez, (2022), show that terminal and operators invest reasonably for the security of goods they store often by employing security staff, alarm system, facing

and gate constructions. Comparable revelation on Tanzania is lacking, as no existing studies the subject matter in the country, hence the real value of cargo security of goods is hard to recognize. Investigation reveals that Dares Salaam port and operators do not organize data and information about their security problems and/or they do not effectively utilize it in their security plans.

1.1.3 Local Perspective on Supply Chain Security Management

In Kenya, the subject of security for supply chains and logistics functions have risen in significance both in practice as well as in the research and have emerged as its own area of research within SCM and logistics. In consequence of the security risks associated with the roads and transport sector, numerous regulations were put in place to combat security threats and allow interdiction of terrorist attacks involving transport and logistics systems. The foremost threat is considered to come from containerized, but hijacking and rerouting of hazardous materials for malicious purposes are also included as potential security risks (OECD, 2020).

Supply chain disruptions caused by external events can have a significant financial and operational impact on organizations not properly prepared. Therefore, improving security in supply chains is critical (Hale and Moberg, 2021). One critical component of security management planning in supply chains is the storage of emergency supplies, equipment, and vital documents that will be needed in times of crisis. Storing emergency supplies at every supply chain facility can be cost-prohibitive. In addition, gaining access to emergency supplies that are stored at each facility may be prevented by some external events, such as fires or hurricanes, because items stored on-site are destroyed or are inaccessible. Therefore, the proposed secure site selection process can balance operational effectiveness and cost-efficiency by identifying the minimum number and possible locations of off-site storage facilities (Hale and Moberg, 2021).

A research carried by Jemutai and Kibet (2022) on effect of Supplier Assessment on Performance of Road Construction Projects in KURA found that supplier assessment

affects quality, cost and time performance of road construction projects. Inferential statistics showed that there was a positive correlation between performance of road construction projects and supplier assessment in terms of timely delivery of the projects, costs and quality with a correlation figure of 0.526.

Mwilu (2022) posits that as reported by PPOA in the public sector in Kenya, suppliers are in most cases conventionally selected based on low price and less importance is given to the suppliers who give assurance of on time delivery and long-term relationships. Gachanja (2021) contends that the performance of roads in Kenya have not been adequate considering the presence of potholes on the majority of roads and traffic congestion have become a serious problem particularly in the urban areas. According to Musyoki and Ngugi (2022) many suppliers have encountered challenges in dealing with the public organization during pre-contract, contract and post contract phavees including but not limited to lack of poor communication, poor response to complaints and lack of commitment and equality.

1.1.4 Ministry of Roads and Transport Construction Agencies in Kenya

The Ministry of roads and transport in Kenya was established in 2013 as a merger of the Ministry of Transport and the Ministry of Public Works (RoK, 2015). The Ministry's roles and responsibilities include: developing, maintaining and managing the national road network; developing and implementing policies, laws, and regulations for the transport sector; and promoting the development of efficient, safe, and sustainable transport systems; coordinating the activities of all transport-related agencies and parastatals. The Ministry of Roads and Transport (MRT) is responsible for the planning, development, and maintenance of roads, bridges, and other transportation infrastructure in the country (Mwenda, 2022). As such, it is essential that the MRT effectively manages the supply chain of goods and services required to carry out its mandate.

Road and transport construction in Kenya is implemented through agencies established under the Kenya Roads Act (2007), notably KeNHA, KURA, and KeRRA and each is

responsible for a distinct road network category. In the current government structure, the State Department for Roads within the Ministry of Roads and Transport provides policy direction and oversight through technical divisions and the road agencies. The supply chain performance of the Ministry of roads and transport construction agencies in Kenya is critical to the successful planning, development, and maintenance of roads, bridges, and other transportation infrastructure in the country (Kihoro, 2022). Overall, the MRT's performance can be evaluated based on several key factors such as: On-time delivery by ensuring that goods and services are delivered within the agreed-upon timeframe; cost control- Managing costs associated with the procurement and delivery of goods and services; and Relationship management by building and maintaining strong relationships with suppliers and other stakeholders (Kihoro, 2022). Also, Mwenda (2022) indicated other measures like inventory management, that is, effective management of inventory levels to minimize stock-outs and overstocking; and quality assurance through ensuring that goods and services meet the required standards and specifications (Mwenda, 2022).

In recent years, the Ministry of Road and Transport Kenya have been under pressure to improve its performance, with a focus on reducing costs, increasing efficiency, and improving quality (Kihoro, 2022). The Ministry have implemented new policies and procedures to enhance the performance of its supply chain operations (Mwenda, 2022). However, there is still room for improvement as the ministry often face delays in delivering projects and some of the materials used in construction are of poor quality (Kihoro, 2022). Research on this topic could include an analysis of the MRT's current supply chain performance, identification of any vulnerabilities or areas for improvement, and recommendations for enhancing the efficiency and effectiveness of the MRT's (Kihoro, 2022). This study therefore seeks to establish the influence of supply chain security management on the performance of ministry of roads and transport construction agencies in Kenya.

1.2 Statement of the Problem

In Kenya, the Ministry of Roads and Transport plays a critical role in the country's economy. The success of the manufacturing sector is particularly dependent on efficient and reliable infrastructure that would facilitate low-cost production, transportation and distribution of manufactured goods (Sarathy, 2022). For Kenyan manufacturers to thrive in an open and global economy, they must be able to reliably manufacture world-class goods at a competitive cost (Okok & Mboya, 2021). To facilitate this, the government of Kenya continues to invest in high-quality infrastructure and implement transport policies aimed at enhancing efficiency and reducing the cost of doing business.

However, statistical evidence suggests that there is a problem with the performance of road infrastructure projects in Kenya. According to a report by Mwandali (2022), despite the creation of the Kenya National Highways Authority, Kenya Urban Roads Authority, and Kenya Rural Roads Authority, Kenya continues to face several challenges that lead to poor performance of the projects. On average, only 39.4% of the road infrastructure projects constructed by local firms in Kenya were completed within the budgeted cost and scheduled time. This is significantly lower than the performance ratings of other countries in the region, such as Uganda (40.5%) and Tanzania (43.7%). Furthermore, a study by the World Bank found that among the countries rated, Kenya scored the lowest in performance of road construction projects. In addition, a study by the World Bank (2020) found that Kenya ranks poorly in terms of logistics performance, with a score of 2.9 out of 5. This is lower than the average for Sub-Saharan Africa and indicates that the country faces significant challenges in terms of supply chain efficiency. Additionally, a study by the Kenya National Bureau of Statistics (KNBS) (2022) found that the transport and logistics sector in Kenya is characterized by high costs, lack of standardization, and inadequate infrastructure, which negatively affects the country's competitiveness.

Empirical studies have shown that the efficacy and efficiency of a supply chain are dependent on internal factors such as progressiveness, collaboration, inter-firm relations, company culture, and management skills (Badenhorst-Weiss & Waugh, 2022).

Disruptions in the supply chain can occur due to security threats at any given time (Urciuoli *et al*, 2022). Research have shown that effective implementation of supply chain security initiatives can be achieved through the coordination of personnel, processes and technology, and the development of technical, formal and informal controls of the security system (Akram, 2022). Schiele (2022) argues that the main challenge for businesses is to invest wisely in security in such a way that they comply with regulations and at the same time attain potential additional benefits that contribute towards achieving efficiency along the supply chain.

Despite the government's efforts to address the performance of road infrastructure projects, empirical studies have shown that the performance of these projects in Kenya is still lacking. Given the above-mentioned statistics and the importance of supply chain security management, it is crucial to establish the relationship between supply chain security management and performance in the context of the Ministry of roads and transport construction agencies in Kenya. The current study sought to fill this gap in the literature by investigating the role of supply chain security management and its interacting effect with legal structure on performance of the Ministry of roads and transport construction agencies in Kenya.

1.3 Objectives of the Study

1.3.1 General Objective

The general objective of the study was to establish the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya.

1.3.2 Specific Objectives of the Study

The study was guided by the following specific objectives: -

i. To establish the influence of freight security management on supply chain performance of ministry of roads and transport construction agencies in Kenya.
ii. To determine the influence of facility security management on supply chain performance of ministry of roads and transport construction agencies in Kenya.
iii. To establish the influence of information security management on supply chain performance of ministry of roads and transport construction agencies in Kenya.
iv. To evaluate the influence of resource security management on supply chain performance of ministry of roads and transport construction agencies in Kenya.
v. To determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya

1.4 Research Hypotheses

This study was guided by the following research hypotheses

H_{01}: Freight security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya

H_{02}: Facility security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

H_{03}: Information security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

H_{04}: Resource security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

H_{05}: Legal structure have no significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya.

1.5 Significance of the Study

This study was significant to various stakeholders on supply chain security management, legal structure and supply chain performance of ministry of roads and transport construction agencies in Kenya. Specifically, it provides useful insights, to the ministry of roads and transport, policymakers, researchers and practitioners.

1.5.1 Ministry of Roads and Transport Construction Agencies in Kenya

The study provides insight to the Procurement and Supply Chain Officers at the ministry of roads and transport construction agencies in Kenya on supply chain security management, legal structure and supply chain performance. Thus, this study contributes by developing in-depth understanding regarding on the influence of freight security management, facility security management, information security management, resource security management on the supply chain performance of ministry of roads and transport construction agencies in Kenya. Further, the study also shows the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya.

1.5.2 Policy Makers

The study also benefits many stakeholders since it informs the policy makers on the areas of the supply chain security management that require policy interventions for the purpose of providing an efficient supply chain. The findings also help the Government of Kenya and other regulatory bodies formulate and implement policies that would facilitate effective development and implementation of supply chain security management strategies.

1.5.3 Researchers and Academicians

This study was of value to scholars and researchers as it adds knowledge to the existing research on supply chain security management and supply chain performance of the ministry of roads and transport construction agencies in Kenya. The study generates empirical and theoretical body of knowledge which would be useful to scholars and supply chain practitioners. The research have identified areas for further research and this is useful to supply chain management students. The results of this study have the potential to serve as a foundation for further scientific research on the subject.

1.6 Scope of the Study

The study focused on the influence of supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. In addition, the study sought to determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of the ministry of roads and transport construction agencies in Kenya. Supply chain security management entails; freight security management, facility security management, information security management and resource security management. The research used a cross-sectional survey design. The unit of observation in this study was the three road and transport construction agencies which are the Kenya National Highways Authority, Kenya Urban Roads Authority and Kenya Rural Roads Authority. On the other hand, the unit of analysis was Procurement and supply chain management employees working with the three agencies. The study was conducted between November 2022 and June 2023.

1.7 Limitations of the Study

The secrecy and fear of victimization especially on issues that deemed detrimental to the organization by the employees ended up limiting the study. Furthermore, some information was a challenge to obtain since access to such information was private to

senior managers who were not willing to release such information. The researcher wrote a letter requesting for permission to collect data about the subject matter under investigation, in order to enable him have an access to the data. Moreso, it is important to note that the study was conducted with proper authorization the National Commission for Science, Technology and Innovation (NACOSTI). This undertaking helped greatly in overcoming the limitation.

Some respondent were not willing to cooperate due to their busy activities that they were undertaking at the time when the researcher expected them to fill the questionnaire. To overcome the limitation, the researcher visited the management earlier so as to be given a convenient time, which gave room for data collection.

The busy working schedules of the workers made it difficult for the study to be a successful one since the respondents were not able to give effectively the desired information due to their tight schedules. To overcome the limitation, the researcher consulted with the management so as to be given the right time when schedules were not very tight. This greatly assisted to overcome the limitation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the review of the literature related to the subject under the study. It consists of theoretical review, conceptual framework and furthermore, it also represents key findings of past similar studies, a critique of existing literature, research gaps and finally the summary.

2.2 Theoretical Framework

A theoretical review is a set of interrelated concepts, including theories and models, but often not as well developed (Ravitch & Riggan, 2022). A theoretical framework directs the study, specifies whatever the investigator will evaluate or measure and the particular statistical links the study explores. Theoretical frameworks are of major significance in deductive, hypothetical-testing studies. This study was anchored on the following theories: Technological Acceptance Model (TAM), Resource Based View Theory, Contingency Theory, Human Capital Theory and Systems Theory.

2.2.1 Technological Acceptance Model (TAM)

The Technology Acceptance Model (TAM)**,** developed by Davis (1989), is a theoretical framework used to understand how users accept and use new technologies. TAM posits that the perceived usefulness (PU) and perceived ease of use (PEOU) of a technology determine its adoption. In the context of supply chains, technologies such as GPS tracking, RFID, blockchain, IoT sensors, and warehouse management systems can improve freight security in terms of cargo safety, trackability and traceability.

Technology Acceptance Model (TAM) was a framework introduced by Fred Davis in 1986 as part of his doctorate proposal, and soon gained popularity as one of the most

useful framework to understand how users are willing to accept or reject a new technology. TAM have proved to be a mature and reliable model to measure how a new technology, is well received by the stakeholders in the oil and petroleum industry, (Vincent, & Honglei 2020). TAM is one of the most widely used theories in innovation and information systems research. It have been considered as the most robust, parsimonious and persuasive model in innovations acceptance behaviour (Wanjiku & Mwangangi, 2022).

The technology acceptance model is the information systems theory that shows how users come to accept and use technology broadly it emphaveize that the intensity of an individual intention to use a technology can be explained jointly by his or her perception about the technologies usefulness and attitude towards the technology in the firm (Chau & Hu, 2022).The model suggested that when organization users are presented with a new technology, a number of issues influence their decision about how and when they will use the technology, perceived usefulness and perceived ease of use (Bagozzi, Davis, & Warshaw, 2022).King& He (2022) concluded in a statistical meta-analysis of the technology acceptance model as applied in various fields analysed 88 published studies that provided sufficient data to be credible. The results showed that TAM was a valid and robust model that have been largely used, but which potentially have wider implications in organizations. Technology Acceptance Model (TAM) was used in this study to establish the influence of freight security management on supply chain performance of ministry of roads and transport construction agencies in Kenya.

2.2.2 Resource Based View Theory

Resource-Based View (RBV) theory was developed by Barney's in 1991. According to Barney (1991) the resource based view examines the link between a firm’s internal characteristics and performance’. Building the resource based view enable firms to determine their core competences which are also critical for the creation of the latter (Espino-Rodríguez & Padrón-Robaina, 2022). This theory will be adopted since suppliers are considered resources to the institutions. RBV believes that a firm's

resources and capabilities are its most important assets. The primary concern of RBV is about obtaining access to another firm's core competencies to gain competitive advantage.

According to Steinle and Schiele (2022) suppliers can be regarded as resources in case they are “sufficiently bound to a firm”. With these assumptions they clearly follow the extended resource based view, e.g. the relational view as mentioned in Dyer & Singh (2017), implying, resources can also be obtained through inter-firm connection from the external environment. They proceed by setting suppliers in context with the four resource attributes, mentioned in Barney (1991), and required to achieve a competitive advantage. Following his logic, suppliers can be argued to contribute to a competitive advantage in case they offer valuable products (Steinle & Schiele, 2022). It is argued, that within an industry only few suppliers exist which offer valuable resources, being a preferred customer of them can have a contribution to a competitive advantage of the firm, which supports the focus of the resource based view (Steinle & Schiele, 2022).

Therefore, the resource based contributes to the decision about the supplier portfolio by considering the relationship between buyer and supplier as the mean to achieve a competitive advantage. Suppliers are seen as valuable resources themselves or as the source to access them, and by becoming their preferred customer, firms do not only gain preferential treatment but also the ability to distance competitors which do not have the same status, that eventually can lead to a superior competitive position. The Resource Based View Theory is important as it establishes the relationship between the abilities of organizations and how it have influence on their performance (Barney *et al*., 2001). In the RBV theory, resources are all the tangible and intangible assets that organizations use to conceive and implement their strategies. The theory have three significant constructs –, that is, resources, capability, and competencies (Yang *et al*., 2022).

The performance of organizations is contributed to a firm’s resources such as facilities, humans, cargo and information. Competitive advantage is gained by organizations that are able to manage their resources effectively (Dangayach and Deshmukh, 2022).

Security along the supply chain is attributed to the capabilities that are heterogeneously dispersed in the organizations and would have cost implication on the organizations for their transfer. Hence, effective supply chain security administration needs adaptation of the RBV as the resources and capabilities are two valuable factors for supply chain security management and performance (Martens *et al*., 2022). Resource Based View Theory was used to determine the influence of facility security management on supply chain performance of ministry of roads and transport construction agencies in Kenya.

2.2.3 Contingency Theory

The theory of constraints is a set of management tools created by Eliyahu Goldratt in 1984. The theory is applicable in many areas including project management and performance measurement among many others (Blackstone, 2010). The theory helps organizations to identify the most important constraints or bottlenecks in their processes and systems, and dealing with them in order to improve performance. According to Goldratt (2020), organizational performance is dictated by constraints present in processes and systems. Constraints are restrictions that hinder an organization from maximizing its performance and achieving its goals and objectives (Goldratt, 2020). He states that constraints can involve policies, equipment, information, supplies or even people, and can be either internal or external to an organization.

Theory of constraints can be applied in conjunction with other management techniques such as total quality management and risk management to ensure a comprehensive set of techniques that ensure continuous improvement in all areas of operation in an organization (IMA, 1999). Organizations use this for control and assessment based on their configuration. Managers can track and respond using both feedback mechanisms that is the bottomup and top-down in many ways. In some organizations, monitoring and evaluation may be automated. In the various stages of the project life cycle, companies also use various tracking and assessment methods (Otley, 2022)

Programs depend on the settings of the stakeholders and their actions. The key to the success of a program creativities is depended on how well it manages relationships with key stakeholders, which includes clients, staff, vendors, families, contributors and others, who which influence the goals achievement (Joslin, 2022). Contingency theory was used in this study to establish the influence of information security management on supply chain performance of ministry of roads and transport construction agencies in Kenya

2.2.4 Human Capital Theory

The proponent of human capital theory is Schultz (1961) but was developed extensively by Becker (1964). Schultz (1961) in an article entitled "Investment in Human Capital" introduces his theory of Human Capital. Schultz argues that both knowledge and skills are a form of capital, and that this capital is a product of deliberate enterprise growth. Therefore, an organization should invest in people through education and training. According to Schultz acquisition of knowledge and skills is compared to acquiring the means of production. The difference in earnings between people relates to the differences in access to education and health. In the theory Schultz argues that investment in education and training leads to an increase in human productivity, which in turn leads to a positive rate of return and hence of growth of organizations.

The theory stresses the value addition that people contribute to an organization. According to this theory, people are regarded as assets and it stresses that investments by organizations in people will generate worthwhile returns. These must be retained in the organization if it have to perform well. The theory is associated with the resource-based view of strategy developed by Barney (1991) who proposes that sustainable competitive advantage is attained by an organization if it have a human resource pool that cannot be imitated or substituted by its competition. Therefore, organization should always strive to attract the best talent through investment in training and development. This will always help retain the people who have the best skills that can create a competitive advantage for the organization that will improve its returns. These returns are expected

to be improvements in performance, productivity, flexibility and the capacity to innovate that should result from enlarging the skills base and increasing levels of knowledge and competence.

The theory supports talent development and retention in the organization. The human capital theory posits that human beings can increase their productive capacity through greater education and skills training. Intellectual and human capital are treated as renewable sources of productivity. Organizations try to cultivate these sources, hoping for added innovation or creativity. Sometimes, a business problem requires more than just new machines or more money.

Not all economists agreed that human capital directly raises productivity. In 1976, for instance, Harvard economist Richard Freeman argued that human capital only acted as a signal about talent and ability; real productivity came later through training, motivation, and capital equipment. He concluded that human capital should not be considered a factor of production (Richard, 1976). Around the same time, Marxian economists Samuel Bowels and Herbert Gintis argued against the human capital theory, stating that turning people (i.e. labor) into capital essentially squashes arguments around class conflict and efforts to empower workers' rights (Samuel & Herbert, 1975). In the 1980s and 1990s, with the rise of behavioral economics, new critiques were leveled at the human capital theory in that it relies on the assumption that human beings are rational actors. Therefore, the human capital theory will experience the same defects and limitations when it attempts to explain phenomena because its basic assumptions on human motives, goals, and decisions are; it turns out, not well-grounded (Blair, 2021). This study used human capital theory to evaluate the influence of resource security management on supply chain performance of ministry of roads and transport construction agencies in Kenya.

2.2.5 Systems Theory

General System Theory was initially developed in 1972 by the Hungarian biologist Ludwig von Bertalanffy. From such a sociological viewpoint, the theory of systems is an institution's cross - disciplinary strategy (Von Bertalanffy, 1972). There are four elements in a sociological system, notably: attributes, objects, internal object-environment interactions (Osifo & Omoregbe, 2022). Components are regarded to be pieces, components, or variables within the system (Zenko, Rosi, Mulej, Mlakar &

Mulej, 2022). Characteristics are the features, aspects and qualities of a device as well as its components. Each system contains internal connections between its components that exist.

A system may also be viewed as a set of individuals working together to serve a particular function. A system is isolated by a boundary from its setting, separating what would be in the system and which is not. The theory of the open system focuses on the interactions between different departments and individuals in an organization, as well as the connection between the organization and its external environment (Gunasekaran & Choy, 2022). An entity is a system created by an efficient input-output in which the pressure first from output initializes the system through applying the principle of open systems approach (Lindskog, 2016). All other areas of the organization are influenced by the changes in one part of the organization (Nilsson & Gammelgaard, 2022). The primary role of management of an organization is to serve as a boundary-linked pin within the organizational structure between the different subsystems. The theory of systems focuses on the position of complex systems in society, nature and science, and is a structure that can be used to explain and examine a group of objects that act as a unit that result in some result (Rudolf, 2022). This study used systems theory to determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya

2.3 Conceptual Framework

According to Hammond and Wellington (2012), the conceptual framework is a description of the basic link amongst variables in research. This allows the researcher to see the projected relationship clearly. This study explored the influence of freight security management, facility security management, information security management and resource security management as independent variables and performance of ministry of roads and transport construction agencies in Kenya as dependent variable being moderated by legal structure. This is illustrated in figure 2.1.

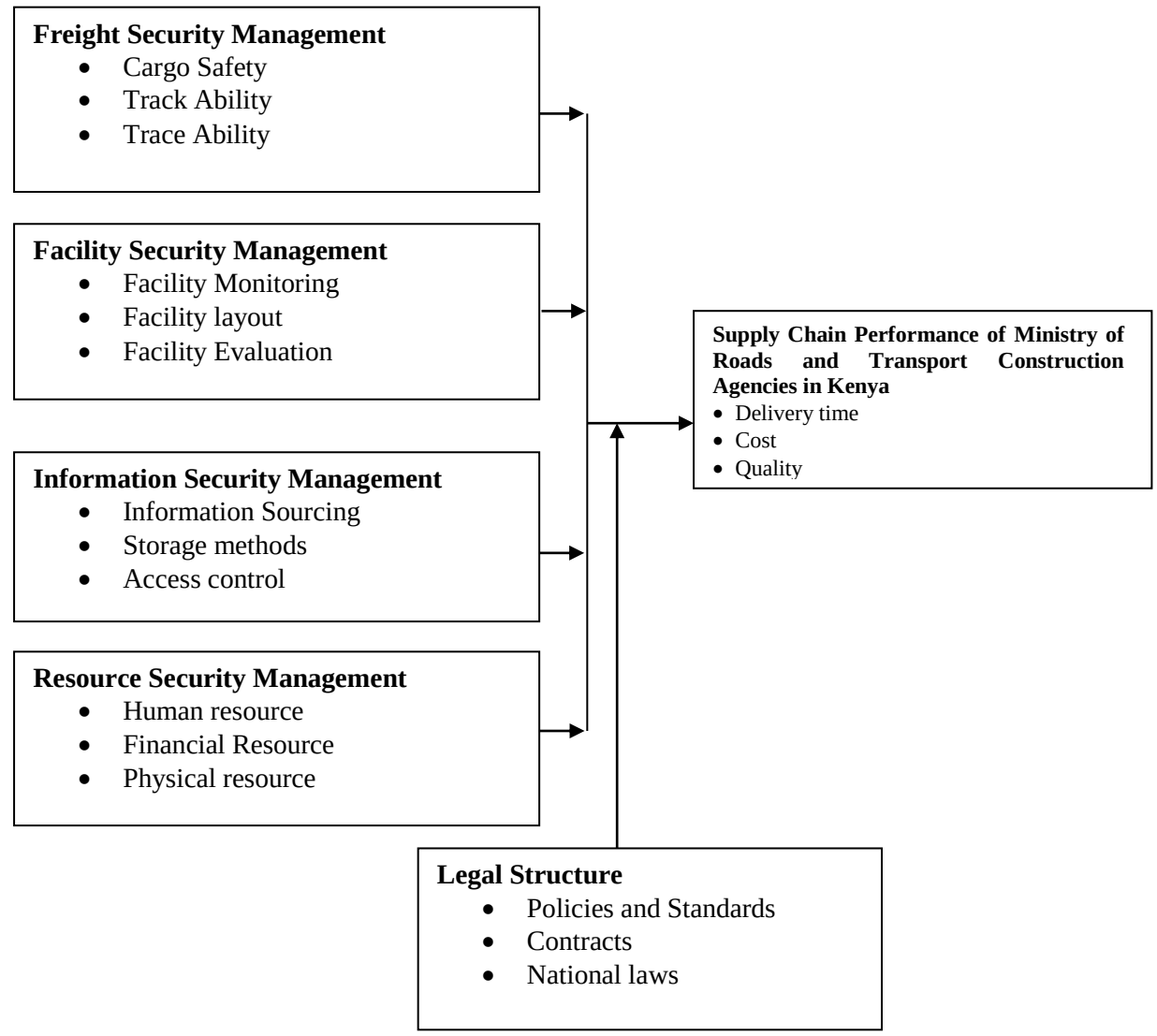

Figure 2.1: Conceptual Framework

2.3.1 Freight Security Management

Freight security management is the process of efficiently and strategically moving freight across a network from its point of origin to its desired destination using various modes of transportation, intermediaries, and technologies. The process employs logistics and supply chain expertise, physical assets such as trucks, distribution centers and warehouses, and technology to move freight efficiently and cost-effectively. Transport security is a blend of protective actions, human and material resources planned to safeguard transport infrastructure, vehicles, systems and workers against intentional unlawful acts (Sanchez, Harris, & Mason, 2021). There is increase in technological advancement such as anti-theft devices and after-theft systems (Wang, 2022). Attention is given to various tracking systems that track the goods throughout transport (Zaida, Jaaronb, & Bonc, 2022). However, application of different technological systems is just but a fraction of transport security strategy (Ogaga, 2022). There is need for tracking and tracing all the cargo while on transit to guarantee its protection as well as the transportation vessel

Freight security management entails cargo safety, track ability and trace ability. Cargo is transported through land, air, or water which requires special care and attention to safety in order to ensure prevention of human, material, or financial loss, damage, and contamination of cargo. Depending on the type of cargo, different cargo handling and securing equipment are used to hold shipments in place while cargo handling or transporting (Njambi, &Katuse, 2022). If the safety of the cargo is not taken seriously, the consequences are very serious and irreversible. Safety of cargo involves safe packaging of cargo in containers, prevention of tampering of the cargo container and safely transporting of the container to its final destination (Mwangangi, 2022).

2.3.2 Facility Security Management

Facility security management is a professional management discipline focused on the efficient and effective delivery of logistics and other support services related to real

property and buildings. It encompasses multiple disciplines to ensure functionality, comfort, safety and efficiency of the built environment by integrating people, place, process and technology. According to Wang (2022) facility security management focuses on how these facilities are being managed. It can be defined as a management discipline that ensures effective and efficient support services for different organizations. It is a function within an organization that integrates people, process, place and technology within the existing environment and focuses on improving the productivity of the organization and the quality of people's life.

The integrated planning of the workplace to improve the performance of the organization is referred to facility management (Wang, *et al* 2022). Facility security management is the security of the amenities where goods are stored and issued (Sanchez, Harris, & Mason, 2021). Optimum warehouse layout designing (e.g., entry/exit controllability; clearly marked control areas; adequate lighting conditions) and efficient facility monitoring (e.g., 24-hour surveillance, security guards and taping activities of loading containers) are the commonly used practices in facility management (Hintsa *et al*., 2022). Safeguarding the facilities in an organization is critical because the most valuable assets such as goods and critical information that will have a negative impact on the performance of the organization are stored there.

Facility security management entails; facility monitoring, facility layout and facility evaluation. Facility Monitoring Systems, also known as Environmental Monitoring Systems (EMS) are used to monitor key manufacturing processes, ensure regulatory compliance and increase product yield. Effective FMS solutions provide essential continuous monitoring of facilities in various industries requiring critical cleanroom management including the aseptic and controlled environments of pharmaceutical, biotechnology, clinical, defense and microelectronics manufacturing (Li & co, 2022). The FMS monitors the status of a facility through the use of a combination of fixed and portable instruments for viable and non-viable particles, as well as other environmental sensors for pressure, temperature, relative humidity etc. An industrial architecture design, combining robust IT hardware and processors with a range of software options

ensures compliance, data security and system availability (Sillekens, Koberstein, & Suhl 2022).

2.3.3 Information Security Management

Information security management concerns a cycle of organizational activity: the acquisition of information from one or more sources, the custodianship and the distribution of that information to those who need it, and its ultimate disposal through archiving or deletion. This cycle of information organization involves a variety of stakeholders, including those who are responsible for assuring the quality, accessibility and utility of acquired information; those who are responsible for its safe storage and disposal; and those who need it for decision making (Oromo, & Mwangangi, 2022). Stakeholders might have rights to originate, change, distribute or delete information according to organizational information management policies. Information security management embraces all the generic concepts of management, including the planning, organizing, structuring, processing, controlling, evaluation and reporting of information activities, all of which is needed in order to meet the needs of those with organizational roles or functions that depend on information. These generic concepts allow the information to be presented to the audience or the correct group of people. After individuals are able to put that information to use, it then gains more value (Mwangangi, 2022).

Information relating to organizations' business activities and dealings are occasionally provided to suppliers and partners of the organizations and hence protection of such information to ensure it does not fall in the wrong hands is vital in the competitive world (Kolluru and Meredith, 2020). Therefore, it is important for organizations to put in place adequate security measures to enhance protection of this information/data. Mwangangi, (2022) defined information management as protection of vital data of the business in supply chain and misusing information can be a tool for detecting illicit happenings and avoiding security fissures. Possession of comprehensive information about supply chain activities, both downstream and upstream, also assist to evade security breaches and

guard members in the supply chain process. Unauthorized access to computers and theft of infrastructure are examples of threats in implementation of security initiatives. It also includes access to secured areas, access to smart cards and gargets that contain important data and sensitive to companies (Njambi, &Katuse, 2022).

2.3.4 Resource Security Management

Resource security management is the efficient and effective development of an organization's resources when they are needed. Such resources may include the financial resources, inventory, human skills, production resources, or information technology and natural resources. According to Gómez-Cedeño *et al* (2021) resource security management is the practice of planning, scheduling, and allocating people, money, and technology to a project or program. In essence, it is the process of allocating resources to achieve the greatest organizational value. Good resource management results in the right resources being available at the right time for the right work.

Resource security management is critical for organizations to ensure they are optimizing and allocating resources to the right initiatives – the initiatives that are aligned to corporate strategy and bring the most value. By minimizing waste and duplication, streamlining and automating processes, and maximizing and speeding throughput, the enterprise is in a better position to respond quickly to customer demands and be nimble to change (Tomlin, 2022). Program and project delivery demand better resource management. Regardless of work methodology, leaders seeking to practice effective resource management must balance demand with capacity while also understanding the needs of the business to prioritize, plan, and schedule work with the right teams, people, and skill sets. Gartner says that the opportunity and challenge for leaders is to “respond and move from a static to an agile planning approach, one that can continually reshape the workforce to incorporate changes in business and skill needs (Lee & Özer, 2022)”.

Resource security management entails; Human resource, financial resource and physical resource. Human resources is the set of people who make up the workforce of an

organization, business sector, industry, or economy. A narrower concept is human capital, the knowledge and skills which the individuals command. Similar terms include manpower, labor, personnel, associates or simply: people (Asnordin, Sundram & Noranee, 2020). Financial resources are the funds and assets that finance an organisation's activities and investments. In simple terms, financial resources are the monies that keep a business operating, and there are several ways a business will raise and use its financial resources. Physical resources are tangible items that are used in the operation of the business. Some of the resources are used to operate the business or provide products and services. Other resources are available to support the actions of the company (Gómez-Cedeño *et al*, 2021).

2.3.5 Legal Structure

Legal aspects are actually areas of law jurisdictions that govern the logistics and transportation sector which provisions are made by the government in ensuring and creating a fair playground for all companies involved. Legal structures are the key guidelines put in place by the government to be followed. Legal structures entail; policies, standards, contracts and national laws. According to Ogaga (2022) supply chain policies are largely a matter of co-ordination between people, that is, agreement between individuals who cooperate, and agreement about their competence. In supply chain, processes can be centralized and decentralized (Onono, 2022).

There exists laws on Transportation and logistics law on supply chain in the country. Some of the laws governing transport and logistics in Kenya include the Transport Licensing Act 404, Electric power Act 1997, Energy Act in 2006, International maritime regulations Disposal and Merchant Shipping Act 2009, Public Procurement and Asset Disposal Act 2015. Axle load rules and regulation act that governs the weight & volume limits of vehicles depending on the road in use. E.g. for heavy & bulky goods there are certain weight limits that they are specified to have & the road that they are to use. For example in Kenya, Kenya National Highways Authority have been given this mandate in ensuring that the permissible axle loads are adhered to and if not legal strict measures

are taken by paying a fine up to Ksh 400,000 if the truck is overloaded and the gross weight is 10tones and this have been stipulated in the act cap 403 of the laws of Kenya (Ogaga, 2022). According to Mwangi and Nyaribo (2022) policy management refers to the creation, communication, and management of all the policies and procedures implemented by an organization. Policies are the foundation of governance, risk, and compliance (or GRC) strategy, of course; a good example of a policy that every company uses is a Code of Conduct. Onono, (2022) argues that a contract is an agreement that specifies certain legally enforceable rights and obligations pertaining to two or more mutually agreeing parties. A contract typically involves the transfer of goods, services, money, or a promise to transfer any of those at a future date.

2.3.6 Supply Chain Performance of the Ministry of Roads and Transport Construction Agencies in Kenya

Supply Chain Performance refers to the effectiveness and efficiency of an organization's supply chain operations in meeting the needs of its customers and other stakeholders (Krause, Handfield, & Scannell, 2022). It encompasses a wide range of factors, including on-time delivery, cost control, and quality assurance, all of which are critical to the success of an organization's supply chain operations.

On-time delivery, also known as delivery performance, is a measure of how well an organization is able to meet customer expectations for when goods or services will be delivered (Krause *et al*, 2022). This is an essential component of supply chain performance, as customers often rely on timely delivery of goods and services to meet their own business needs. Cost control is also a key component of supply chain performance. It involves managing the costs associated with the procurement and delivery of goods and services, and ensuring that they are as low as possible without compromising on quality (Krause *et al* 2022). This can include reducing the costs of raw materials, labor, transportation, and other elements of the supply chain. Quality assurance is another important aspect of supply chain performance. It involves ensuring that goods and services meet the required standards and specifications, and that they are

free from defects or other issues that could impact their performance (Krause, *et al*, 2022). This can include testing and inspecting goods and services at various stages of the supply chain, as well as implementing quality control procedures and processes.

A number of studies have highlighted the importance of supply chain performance in achieving organizational success. According to a study by Li, Wang, and Liang (2022), supply chain performance is positively associated with firm performance, and organizations with better supply chain performance are more likely to achieve higher levels of financial performance and customer satisfaction. The study argues that supply chain performance can improve the efficiency and effectiveness of an organization's operations, and can help to reduce costs and improve customer service.

Another study by Gunasekaran and Ngai (2022) found that supply chain performance is a critical factor in achieving competitive advantage. The study found that organizations with better supply chain performance are more likely to be competitive in the marketplace, and are better able to respond to changes in the market and customer demands. The study also highlighted the importance of effective supply chain management in achieving better supply chain performance. In addition, a study by Bowersox, Closs, and Stank (2021) found that supply chain performance is a key driver of customer satisfaction. The study found that organizations with better supply chain performance are more likely to have satisfied customers, and that customers are more likely to be loyal to organizations that meet their expectations for delivery and quality.

Supply chain performance is a critical aspect of an organization's overall performance, and it is essential for organizations to focus on all the component of supply chain performance for the success of their supply chain operations. These studies above have demonstrated the importance of supply chain performance in achieving organizational success. They highlight the fact that supply chain performance is positively associated with firm performance, competitive advantage, and customer satisfaction.

2.4 Empirical Review

2.4.1 Freight Security Management and Performance

Yang and Wei (2021) conducted the effect of supply chain security management on security performance in container shipping operations. Data for this study were collected by questionnaire survey. An exploratory factor analysis was performed to identify crucial security management dimensions in the container shipping sector. Multiple regression analysis was then performed to examine the effect of security management on the security performance. Findings Four crucial security management dimensions were identified: facility and cargo management; accident prevention and processing; information management; and partner relationship management. Multiple regression analysis revealed that information management and partner relationship management had significant positive effects on safety performance, whereas partner relationship management had a significant positive effect on customs clearance performance.

Supply chains are seen as sets of virtual organizations owning numerous sorts of assets and managing resources. A central a part of the assets are the products (raw materials, semi-finished product, finished product, etc.) or shipment that are rapt from the upstream to the downstream part of the supply chain and eventually to the end customers (Bowersox, Closs, and Cooper 2020). The assets could include; machinery, storage facilities, transportation vessels or individuals operating within the supply chain. The best management of those assets is crucial to make sure that the key activities of supply chains – like transportation, storage, merchandise handling and storing, packaging and labelling – happen in an exceedingly cost-effective manner (Kye, Lee, & Lee 2022).

Cargo management refers to protection the cargo throughout all the steps of production, shipping and transport processes (Hintsa *et al.,* 2022). Organizations implement security measures to shield the supply chain against potential risk (Closs *et al*., 2022). Cargo is one of the leading sources of security considerations within the supply chain (Sarathy, 2022). Common security problems whereas handling cargo is stealing, that causes

disturbance within the supply chain (Ekwall, 2022). Transport supply security have gained importance as international economies have embarked progressively on economical and secure supply chains that span the world (Fries, Chowdhury, and Brummond, 2022).

However, incidents such as terrorist attacks, cargo theft, and smuggling, amongst others, have made transport more challenging and uncertain. Terrorist attacks on transport logistics systems during 2000 and 2003 have more than doubled when compared to the previous decade (U.S. Department of State, 2020). The implementation of practices for securing transport logistics systems is expensive and time consuming but the financial benefits may be rather difficult to capture and thus challenging to quantify.

Transport security protects people, data, equipment, systems, facilities and company assets (Harris, 2022). The method in which transport security protects these assets is through "site style and layout, environmental elements, emergency response readiness, training, access management, intrusion detection, and power and fireplace protection" (Harris, 2022). Business continuity or disaster recovery plans are measures needed to cut back business interruption in times of natural disaster, explosion or sabotage. Transport security should set up the way to shield workers' lives and facilities. The primary priority of transport security is to make sure that each one personnel is safe. The second is to secure company assets and restore IT operations if a natural disaster happens. Information security means that keeping data out of the reach of others World Health Organization aren't approved to access and use it by preventing information thieves and hackers from accessing vital information and storage disks, disconnecting network connections, or disconnecting the system (Hutter, 2022).

Rice *et al*. (2022), presents the requirement for corporations to build secure and resilient supply chains. He identifies potential actions to boost physical, freight and knowledge security, classifying them into four levels: Level one – Basic (i.e., physical security measures like access management, badges, camera systems); Level a pair of – Reactive (i.e., existence of offer continuity plans, analysis of offer bases); Level three – Proactive

(i.e., advanced cyber security, business continuity plans); and Level four – Advanced (i.e., learning from past disruptions, formal security strategies). Antagonistic attacks have been widely studied within the criminology discipline. In few words, this means that attacks against supply chains take place whenever the perpetrator, the target and the absence of proper security converge. Increasing security implies that criminals will rationally choose weaker targets. This phenomenon have been clearly observed in freight transport where the securing of terminals in transport chains have caused the decrease of incidents in the links between the terminals (Purtell & Rice, 2022). Hence, many authors agree on the statement that “a supply chain is as weak as the weakest of its links” (Rice & Spayd, 2021).

According to Gutiérrez, *et al* (2022), in their article known as "Voluntary supply chain security program impacts”: Associate in Nursing empirical study with BASC member organizations declared that Supply Chain Security Management may be a comparatively new discipline in the field of operations management analysis, so lacking introductory and tutorial papers. The recent considerations on security in international supply chains are driving the introduction of the latest security initiatives Associate in Nursing extent that they're changing into an integral a part of supply chain management. The paper concludes that a niche exists between theoretical supply chain security studies, rising security standards and sensible social control actions, which the tutorial analysis community contains a clear mission to bridge this gap, e.g., via pragmatic case studies among universal supply chains, consignment security through securing international supply chain and industrial security of products in ports have been a challenge throughout the planet (Cowen, 2021).

2.4.2 Facility Security Management and Performance

Physical security initiatives are the top priorities of organizations. Many organizations are concerned with formal and aesthetic aspects at the expense of attention to security aspects and standards, which may result in a lack of attention to security procedures when designing physical facilities and environments (Harris, 2022). Long-term

relationships achieve stability in operations, make companies more focused on their core competencies while outsourcing to meet their remaining needs, and improve customer relationships by providing the ability to anticipate, track customer demand and respond to their reactions. Customers are encouraged to identify their needs and requests, to provide efficiency and to track delivery through the ability to provide better customer service. Lancaster *et al,* (202) noted that supply chain collaboration is a significant means of increasing sales, reducing supply time, achieving smaller batches, reducing stock levels, rapidly designing new products, and collaborating and coordinating supply chain members, improve corporate performance and shorten the cycle of satisfaction (Fawcett and co., 2022). The results of the Ramesh and co., (2022) study indicate that collaboration among supply chain partners have many benefits, including meeting customer needs more effectively.

Physical assets are directly exposed to security risks, particularly because cargo is the main target of criminals, especially a high value cargo. Next, transport assets and machinery used in the supply chain can also be stolen or used to facilitate criminal activities. If criminals are not able to open a trailer or container to steal its contents, they might prefer to steal the whole conveyance (Urciuoli 2022). Personnel forms also a fundamental part of a supply chain. Without well-trained and motivated personnel, many activities devoted to assets optimization could not be performed efficiently. Some authors suggest that up to 50% of costs along the entire supply chain are labor costs (Sillekens, Koberstein, & Suhl 2022).

Physical security is commonly one of the first security initiatives that organizations undertake to improve system security. Physically preventing access and controlling access keeps out unauthorized personnel, protecting site intellectual property, capital equipment, personnel, inventory, work in progress, finished goods, and product integrity. Traditional approaches to security have focused on theft reduction, which entails protecting against the unauthorized removal of items from the process (Li & co, 2022).

2.4.3 Information Security Management and Performance

One of the greatest pillars for effective and economical supply chains is that of seamless exchange of knowledge from suppliers which is attributed to end customers (Blos *et al.* 2022). Data is ideal for decision-making and generates prices for organizations. Improper management of knowledge might result in irreparable injury to organizations (Michelberger & Labodi, 2022). Over the past decades, organizations have faced challenges in applying transport security (Hutter, 2022), because of the fast development of the technological setting (Hutter, 2022). Organization's area unit currently involved in the transport security of hardware and instrumentality due to the augmented use of mobile devices, together with computers, phones, laborious drives and USB, that makes them susceptible to theft (Carney, 2018). Theft of mobile devices is not the sole approach hackers and attackers will use to get the information they require. Hackers will get vital and sensitive knowledge by connecting a USB or a tiny low memory card to computers while not having to travel into the company database (Scott 2022).

The latest developments of data technology applied to production, transport and consumption of products have introduced mechanical automation, reduced personnel and thereby provided important cost-savings to supply chains. Massive enterprises that are keen to maintain a dominant position within the supply chain in distribution markets ought to promote the appliance of advanced information systems (Dang, Yan, & Lai 2021). The adoption of advanced information systems in supply chains means that sharing and analyzing massive amounts of information among multiple players. Integrated supply chain relationships are vital and integral to the organization's prosperous structure. Supply chain management will be outlined as processes and practices aimed to economical and economical flow of each material and knowledge between the corporate, suppliers and customers (Lancaster and co., 2022). The exchange of data and communication between partners provide the potential for feedback from customers. Therefore, to explore for solutions to organization issues, can beyond any doubt have a positive impact on the organization's performance and outputs.

Information elements typically include several documents proving regulatory compliance or cargo authenticity. However, there is an overall increased attention towards the security of information systems, raising the opportunity to highlight these issues within the supply chain and logistics scientific communities. While these systems may improve supply chain efficiency, it have also been proven that security can be affected (Urciuoli, Mannisto *et al.* 2022). Harris, (2022) explained that it is difficult to protect corporate data, networks and systems, with the increasing use of computers and smart mobile phones. Almost 74,000 staff, suppliers and contractors were exposed to data penetration in 2014 during the theft of laptops that contain essential and sensitive records about their companies (Scott, 2022).

The dynamic nature of the current environment have contributed to the increase of costs that companies incur because of fraud, sabotage and theft (Hutter, 2022). Earthquakes, volcanoes, floods, and lightning, fire or dust waves are external threats that arise from natural disasters not influenced by human activities (Al-Qahtani, 2021). Such disasters could cause serious damage to information systems and could lead to the interruption of electronic services altogether (Hutter, 2022). There is a great need for an information security structure. Information exchanged by 2017, with supply chain partners is one of the most important assets for organizations. Until information is shared, organizations need to make security arrangements (Kollurum & Meredith 2021).

The risk of security incidents and breaches increases due to increased reliance on information technology, and organizations are increasingly vulnerable to various types of cyber-attacks (Jouini *et al*., 2022). Security breaches can cause significant financial losses, disrupt and stop operations. As a result, Information Security Management (ISM) have become an important and required function for all organizations.

Some researchers suggest that proper information management may also improve the flexibility of supply chains (Glenn Richey, Skipper, & Hanna 2022). Lee and Özer (2022) find that by timely downstream sharing of information, upstream disruptions may be promptly avoided or their negative consequences minimized. Tomlin (2022) suggests

that advance information could be used to deal with certain risks, for instance, labor disputes: if a firm have advance information that a strike is imminent, then mitigation inventory may be built in advance. Usage of information sharing in supply chains is an effective approach to deal with supply chain disruptions, for example, those caused by financial, strategic, operational and hazard vulnerabilities (Blos *et al.* 2022).

2.4.4 Resource Security Management and Performance

Gómez-Cedeño *et al* (2021) conducted a study on Impact of human resources on supply chain management and performance. The model is first validated and the hypotheses formulated are tested using the partial least squares structural equation model (SEM), based on five constructs: HRM, SCM implementation (SCMI), SCMO, customer satisfaction and organisational performance, taken from an existing model tested previously in a different geographical context. To do this, a survey was conducted and 231 valid responses were obtained. The empirical results reveal that HRM had significant direct and indirect impacts on SCMO, and SCMI, which in turn played a mediating role in the relationships between HRM and SCMO. CS also played a mediating role in the relationships between SCMO and OP. This finding suggests that the successful implementation of SCM not only directly improves SCMO, but it also indirectly increases CS and OP.

Asnordin, Sundram and Noranee (2020) conducted a study on the influence of professional human resource and firm infrastructure towards supply chain performance. This study is among the foremost in determining and conceptually exploring the relationship between firm infrastructure, human resource management practices and supply chain performance. However, the conceptual approach of this study could result in certain limitations. These limitations can be tackled in future research work that employs the variables in this paper, and other connected scopes of research. The first limitation is that of sample size, and it is suggested that future studies apply different sets of data to corroborate the constructs and models in this study. Ideally, future research should aim to obtain data samples which are sufficiently large, so that a

complete analysis can be accomplished in a single study. The results of this study appear to support the view that the introduction of professional human resource have a substantial effect on the effectiveness of supply chain performance and a direct impact on the performance of manufacturing firms. Third, managers can optimise the firm's infrastructure in tandem with the right professional human resource strategy and subsequently improve the firm's supply chain performance.

Zaida, Jaaronb and Bonc (2022) conducted a study on the impact of green human resource management and green supply chain management practices on sustainable performance. A quantitative method is applied in which data is collected from a customized survey with 121 firms functioning in the most pollutant manufacturing sectors (i.e. food, chemical, and pharmaceutical sectors) in Palestine. The data analysis was conducted using the partial least squares structural equation modeling. The results from data analysis show that both of green human resource management and green supply chain management practices have a positive effect to sustainable performance in a joint manner. In fact, the results revealed that green human resource management practices have a direct effect on the sustainable performance, with the green supply chain management practices mediating this effect. In particular, internal green supply chain management practices positively mediate between green human resources management practices and sustainable performance, whereas external green supply chain management practices mediate only the relationship between GHRM bundle practices and environmental dimension of sustainable performance, thus suggesting absence of awareness among manufacturers regarding the effectiveness of this type of GSCM practices for an improved economic and social dimensions of sustainable performance, and calling for more attention from green training programs

2.4.5 Supply Chain Security Management, Legal Structure and Performance

A legal framework encompasses the laws, regulations, and policies that are put in place to govern an organization or an activity. The legal structure governing supply chain practices in Kenya includes the Public Procurement and Asset Disposal Act (PPADA

2015), Public-Private Partnership Act (2021), government circulars, policies, standards and contract compliance frameworks. Amina and Osoro (2022) demonstrated that procurement legal frameworks significantly influence procurement performance in NTSA. Mutangili (2022) similarly argued that legal compliance, enforcement mechanisms, and regulatory clarity shape supply chain outcomes. Studies on road construction disputes (Mogaka, 2023) reveal that weak legal enforcement leads to contract disputes, litigation, and project delays. Despite this evidence, few studies have empirically tested legal structure as a moderator between supply chain security and performance, creating an important knowledge gap this study aims to address.

Ogaga (2022) conducted a study on the influence of legal structure and industry competition on the relationship between corporate Strategy and Performance of Companies Listed on the Nairobi Securities Exchange. The research population comprised all the sixty three companies listed on the bourse. A descriptive census survey was conducted on the companies with a response rate of seventy three percent. The respondents comprised mainly, top management staff, of the Kenyan listed companies. Statistical tools were applied to evaluate variations in manifestations of the variables and to test the hypotheses respectively. Baron and Kenny model and hierarchical regression used to test for moderating influence of industry competition whereas the mediating role of legal structure was tested using stepwise regression method. The key finding is that joint effect of the predictor variables was greater than the single effect of corporate strategy on performance. The overall results show that the finding was statistically significant in respect of non-financial performance. This supported Industrial economic theory, contingency theory and stakeholder theory.

2.5 Critique of the Existing Literature Relevant to the Study

Although for over a decade, much research had been done on supply chain security management and performance of organisations in developed countries, there is still yet much to be done on supply chain security management when it comes to ministry of roads and transport construction agencies in Kenya. According to Adams (2021), an

average company probably loses around 12 percent of its asset yearly somewhere along the supply chain in the USA. Likewise, the Federal Bureau of Investigation (FBI) in US have reported haul theft in the range between $10 and $30 billion per year (Anderson, 2022). The European Parliament reported theft of lorries and consignments in Europe for a value of about €8.2 billion yearly (European Parliament, 2022). According to other statistical reports, in Europe counterfeited and pirated items amounted to $176 billion in 2007 (Rodwell *et al*., 2022). According to another report from the European Commission, in 2006, almost 3 million of pharmaceutical products were found to be counterfeits (EU Commission, 2020). These figures may be higher, since logistics operators tend to hide the problem to their customers (Ekwall *et al*., 2022). These are alarming quantities of losses that should worry the leadership of any organisation.

Globally, logistics security is an increasingly important issue in Latin America and the Caribbean and is vital to the growth of the region due to the potentially damaging social and economic effects of a break in the logistics chain. In the case of the countries of Central America, the issue is even more strategic given the rising cases of crime affecting logistics chains and driving up the logistics-related costs of doing business. The region puts over US$ 6.5 billion per year into combating insecurity and violence (SICA, 2021).

In Kenya, the subject of security for supply chains and logistics functions have risen in significance both in practice as well as in the research and have emerged as its own area of research within SCM and logistics. In consequence of the security risks associated with the roads and transport sector, numerous regulations were put in place to combat security threats and allow interdiction of terrorist attacks involving transport and logistics systems. The foremost threat is considered to come from containerized, but hijacking and rerouting of hazardous materials for malicious purposes are also included as potential security risks (OECD, 2020).

A research carried by Jemutai and Kibet (2022) on effect of Supplier Assessment on Performance of Road Construction Projects in KURA found that supplier assessment

affects quality, cost and time performance of road construction projects. Inferential statistics showed that there was a positive correlation between performance of road construction projects and supplier assessment in terms of timely delivery of the projects, costs and quality with a correlation figure of 0.526.

Mwilu (2022) posits that as reported by PPRA in the public sector in Kenya, suppliers are in most cases conventionally selected on the basis of low price and less importance is given to the suppliers who give assurance of on time delivery and long-term relationships. Gachanja (2021) contends that the performance of roads in Kenya have not been adequate considering the presence of potholes on the majority of roads and traffic congestion have become a serious problem particularly in the urban areas. According to Musyoki and Ngugi (2022) many suppliers have encountered challenges in dealing with the public organization during pre-contract, contract and post contract phavees including but not limited to lack of poor communication, poor response to complaints and lack of commitment and equality. Nevertheless, these studies were limited to specific countries, contexts and organizations hence the study findings cannot be generalized to the current study.

2.6 Research Gaps

Although various studies have been conducted on the influence of supply chain security management on supply chain performance, these studies were limited to specific countries, contexts and organizations hence the study findings cannot be generalized to the current study. For instance; According to Adams (2021), an average company probably loses around 12 percent of its asset yearly somewhere along the supply chain in the USA; A research carried by Jemutai and Kibet (2022) on effect of Supplier Assessment on Performance of Road Construction Projects in KURA found that supplier assessment affects quality, cost and time performance of road construction projects. Mwilu (2022) posits that as reported by PPRA in the public sector in Kenya, suppliers are in most cases conventionally selected on the basis of low price and less importance is given to the suppliers who give assurance of on time delivery and long-term

relationships. However, none of these studies focused on the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. In addition, none of these studies showed the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. In summary, the knowledge gap identified was that there is limited use of integrated theories combining Technology Acceptance Model, Resource-Based View, Institutional Theory and System Theory in existing studies, so the mechanisms by which supply chain security management leads to supply chain performance are not deeply explored. Further the empirical gap identified was that there are very few empirical studies on supply chain security management and supply chain performance in road construction **or** transport infrastructure agencies. Most of the studies focus on manufacturing, retail, or logistics firms. The contextual gap was that majority of supply chain security management and supply chain performance studies are done in private sector or non-infrastructure contexts; the road construction context (public infrastructure) have unique risk profiles (vandalism, theft, political interference) that are under-researched.

To fill the highlighted gaps, the current study seeks to establish the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. Specifically, the study will show the influence of freight security management, facility security management, information security management and resource security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. In addition, the study also seeks to determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya.

2.7 Summary of Reviewed Literature

The chapter have presented a summary of theoretical literature as well as empirical literature on the topic of study. Specifically, the chapter presents the theory that guides the study including Technological Acceptance Model (TAM), Resource Based View Theory, Contingency Theory, Human Capital Theory and Systems Theory. Use technology Acceptance Model (TAM) was in this study to assess the influence of freight security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. In addition, Resource Based View Theory was used to assess the influence of facility security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. Further, contingency theory was be used in this study to establish the influence of information security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. This study used human capital theory to evaluate the influence of resource security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. Systems theory was used to determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. The chapter further presents the empirical literature that links independent variables with dependent variable and the moderating variable. This is followed by summary of the reviewed empirical studies and the gaps identified from the reviewed studies.

In view of the forgoing, most of the available studies are from the developed countries hence the need to undertake a study in the Kenyan Context so as to bridge the existing gap by the newly created knowledge. From the finding of this study, now scholars can have consensus on the effect of Supply Chain Security management on supply chain performance of Ministry of roads and transport construction agencies in Kenya. The researcher endeavoured to examine this gap and have presented his findings and recommendations on how Supply Chain Security Management can be used to enhance

supply chain performance of Ministry of roads and transport construction agencies in Kenya in future.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the methods that were utilized to conduct the research. It begins with an overview of the research design, research philosophy, target population, sample frame, sample and sampling techniques, data collection instruments, instrument validity and reliability, data collection procedures, pilot testing, and data processing and presentation techniques. Finally, the method of analysis that was utilized to test the hypotheses is presented.

3.2 Research Design

Research designs refer to the overall strategies utilized in the integration of different components of a study in a logical and coherent way, thus making sure it effectively addresses a research problem. It describes a plan for data collection, measurement of variables, and data analysis in a study. Research designs can be descriptive, cross-sectional, experimental, correlational, case study, explanatory or exploratory (Williamson & Johanson, 2022).

The research used a cross-sectional survey design. Within a cross-sectional survey, the study measures the results and experiences of the sample subjects at the same time (Setia, 2022). Cross-sectional survey design gives a clear image of the patterns and is useful at a particular point in time to monitor current research population circumstances, characteristics and their opinion. A cross-sectional survey also describes the prevalence of a given attribute in a specified population at a particular time point. The choice of this design is suitable for this study since it makes use of a questionnaire as a data collection tool. It is also suitable for this research, as it thoroughly tests the relationship among variables. Other researchers who have successfully utilized a cross-sectional survey design include (Wambua, 2022; Somba, 2022; Nyambura, 2022).

3.3 Research Philosophy

A research philosophy refers to the way in which data about a specific topic, concept or phenomenon is obtained, analyzed and utilized. There are four main research philosophies: pragmatism, positivism, realism and interpretivism (Jolivétte, 2021). Pragmatics recognize that there exists different ways of carrying out a research and interpreting a world, and no single opinion, perspective or position can provide the entire picture or a phenomenon (Greenfield & Greener, 2016). According to Viechtbauer, Smits and Kotz (2021), positivists consider reality to be stable and argue that it can be looked at and described from an objective viewpoint without necessarily interfering with the phenomenon being studied. Mitchell and Jolley (2022) indicate that realism refers to the view that things and abstract concepts exist in an external world independent of our perceptions of their existence. Singpurwalla (2021) indicates that interpretivists argue that through interpretation and intervention, reality can be fully understood. Studying a phenomenon in its natural environment is key to the interpretivist philosophy, together with the acknowledgement that scientists cannot avoid affecting those phenomena they study.

This study adopted a positivism research philosophy. The positivism research technique is defined as a philosophical approach of identifying and recognizing items or elements in a particular social construct that have scientific proof and are based on logical as well as factual proof (Metsamuuronen, 2022). Positivism tends to have a strong belief that development of research hypothesis based on theoretical aspects can be tested through observing social realities, and as such, positivism is a scientific technique (Hewson, Vogel & Laurent, 2022). Depending on the observation made, the positivism research philosophy can be used to explain the existing relationship or realities between elements under investigation, and thus can be used to make predictions. In this regard, the intent of the researcher believes that a positivist philosophy was required for this purpose: where the researcher uses the old and new knowledge to bridge the existing gap. The positivism research philosophy was used in this study to establish the influence of

supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya, and the moderating effect of legal structure.

3.4 Target Population

The target population is a collection of research components that refers to all members of an actual or imaginary group of people, events, or objects to whom the findings should be applied (Prabhat &Meenu, 2021). It can also be described as the set of sampling units or cases that the researcher is interested in. The target population, according to Kothari (2022), is a physical representation that contains all the units that could be members of the sample. A population can alternatively be thought of as the whole collection of elements from which the study wants to draw conclusions. According to Weber (2021), a population is defined as a collection of objects, individuals, entities or items out of which samples are drawn for analysis.

The Kenya government have put several measures to address performance of road infrastructure projects which included the enactment of Kenya Roads act which established the Kenya National Highways Authority, Kenya Urban Roads Authority and Kenya Rural Roads Authority (Kenya roads authority, 2020). The unit of analysis in this study was the three road construction agencies which are the Kenya National Highways Authority, Kenya Urban Roads Authority and Kenya Rural Roads Authority. On the other hand, the unit of observation was procurement and supply chain management employees working with the three agencies. The study mainly focused on procurement and supply chain managers as they play a critical role in supply chain of their respective organizations and were in a position to provide the requisite data and information for the finalization of the research. Therefore, the target population for this study was 420 procurement and supply chain management officers as shown in Table 3.1 below.

Table 3.1: Target Population

Agency	Population (No.)	Proportion (%)
KeRRA	166	39.52
KeNHA	154	36.67
KURA	100	23.8
Total	**420**	**100.0**

Source: Kenya Roads Authority (2020)

3.5 Sampling Frame

A sampling frame is a list of all the items from which a representative sample is taken for research purposes (Sekaran, & Bougie, 2021). It's a list of people in the study's population from whom a random sample can be taken (Kothari, 2021). The sample frame for this study was created from a list of procurement and supply chain management officers from all the three road agencies in Kenya; that is KeNHA, KeRRA, and KURA. As a result, the sampling frame consisted of 420 procurement and supply chain managers.

3.6 Sample and Sampling Technique

A sample is a representative of certain known percentage, frequency distributions of elements' characteristics similar to the corresponding distributions within the whole population (Lütfi, 2020).

3.6.1 Sample Size

Kothari (2014) explains that a sample size refers to the number of items to be selected from the universe to constitute a sample while sampling procedures refers to the technique used in selecting the items of the sample. The overall sample size for this study was determined using Nassiuma (2020) formula as indicated below.

$$n = \frac{NC^2}{C^2 + (N-1)e^2}$$

Where n is the sample size, N is the population, C is the coefficient of variation (0.5) and e is the precision level of (0.05). The samples sizes were computed as follows for each agency. The study adopted a sample size of 83, 75 and 43 for KeNHA, KeRRA, and KURA respectively.

Therefore, using Nassiuma (2020) formula, the sample size for the study was 201 procurement and supply chain managers.

3.6.2 Sampling Procedure

According to Bryman, and Cramer, (2021), sampling is the process of selecting a group of people, events, or behaviors to examine. Sampling is used when it is not possible to include the whole population in a study (Cooper & Schindler, 2021). Stratified random sampling is the technique was used in selecting the sample for this study. When the population is heterogeneous, according to Creswell, (2021) stratified random sampling is appropriate. Stratified sampling is the most efficient method of sampling because there is minimal chance of any critical population group being omitted (Cronbach, 2021). In our study, the population was grouped into three strata, that is; Managers by KeRRA, KURA, and KeNHA. Stratification reduces standard error by having a level of control on the variance and also allows equal representation of population from each group. The study then used simple random sampling in selecting a sample from each strata. The advantage of Random sampling is that it ensures that the sampling error is minimal which increases precision of techniques of estimation in use (Cooper & Schindler, 2021). The sample size for each road agency was as shown in Table 3.2

Table 3.2: Sample size

Agency	Population (No.)	Proportion (%)	Sample Size
KeRRA	166	39.52	83
KeNHA	154	36.67	75
KURA	100	23.8	43
Total	**420**	**100.0**	**201**

3.7 Data Collection Instruments

There are several ways of collecting data, which differ considerably in terms of money costs, time and other resources at the disposal of the researcher (Orodho, 2020). The choice of data collection instrument is often very crucial to the success of a research and thus when determining an appropriate data collection method, one have to take into account the complexity of the topic, response rate, time and the targeted population (Mwangi, 2021). Different tools are used to collect different types of data. There is primary data that is collected directly from the respondents; it is information that have never been collected while there is secondary data collection tools that are used to collect secondary data.

In this study, primary data was collected using a semi structured questionnaire because they are cost effective and convenient to collect and summarise responses (Zikmond, 2021). Kothari (2021) indicates that a questionnaire is a cost efficient method to collecting information particularly from a huge group of respondents and it facilitates anonymity. Questionnaires consist of a series of specific, short questions that are asked verbally by the interviewer or answered by the respondents on their own (Bryman, 2022). According to Sekaran (2021), the questionnaire is advantageous since it covers a population in a short amount of time and at a low cost, and it increases the independence and accuracy of responses from respondents. In addition, respondents are given a structured questionnaire, which was chosen since it provides a more thorough picture than any other research instrument. The questionnaire is developed in a systematic manner in accordance with the study objectives.

There are three basic types of questionnaires; close ended, open-ended or a combination of both. Close-ended questionnaires are used to generate statistics in quantitative research while open-ended questionnaires are used in qualitative research, although some researchers quantify the answers during the analysis stage (Dawson, 2022). This study used both closed-ended questions and open-ended questions to collect the data. Closed-ended questions were used where respondents were restricted to direct their answers without further explanation while the open-ended questions sought respondent's views on variables being studied. The use of a semi structured questionnaire have also been adopted by Gitahi (2021), Sialala (2022) and Havesan (2022) in their studies.

The questionnaire includes Likert scale psychometric constructs with a scale ranging from 1-5 where each respondent was required to rate each and every statement given describing a given variable. The scale ranges from 5=Strongly Agree, 4=Agree, 3=Neutral, 2= Disagree and 1=Strongly Disagree. At the end of each Likert scale questions, open ended questions are included to allow the respondent give additional information that is not captured in the Likert scales questions.

3.8 Data Collection Procedure

According to Rotich (2022), data collection refers to gathering information to serve or prove some facts. Burns and Grove (2021) define data collection as the precise, systematic gathering of information relevant to the research sub-problems, using interviews, participant observations, focus group discussion, narratives, and case histories. The questionnaire method have been selected because it is an unobtrusive and inexpensive method for data collection (Grønhaug, 2022). For purposes of this study, data collection was done through the use of questionnaires. Based on the nature of the survey interaction, a questionnaire can be distributed to respondents using several modes: mail, telephone, internet, or face-to-face (Rotich, 2022). This study adopted the self-administered questionnaire approach. Self-administered questionnaires offer researchers the potential to reach a large number of potential respondents in a variety of

locations (Cooper & Schindler, 2022). Gitahi (2021), Sialala (2022), and Havesan (2022) used self-administered questionnaires in their studies.

Before embarking on data collection, relevant approvals were obtained. An introductory letter from the JKUAT Nairobi campus introducing the researcher to relevant authorities for field data collection was first obtained. This letter was used to obtain the permit for research from the National Commission for Science, Technology, and Innovation (NACOSTI). In addition, the researcher sought permission from the respective agency to collect data. Follow-up calls and emails were then made to book an appointment.

During the appointment, the significance of the study was explained. The data collected from the field was done with the aid of three research assistants. It is expected that the use of the research assistants improved the return rate of the questionnaires since any clarifications on the questionnaire were made contemporaneously. The research assistants were trained on research ethics and on the research instrument and its administration and data recording. An introductory letter for the research assistant to collect data on the researcher's behalf was given to the research assistants.

3.9 Pilot Study

In social science research, the word "pilot study" have two meanings. It can refer to "feasibility studies," which are small-scale versions, or "trial runs," carried out in advance of a larger investigation (Polit & Beck, 2022). A pilot study, according to Kothari (2020), is an imitation and rehearsal of the main survey. A pilot study, on the other hand, might be used to test or try out a new research instrument (Gujarati, 2022). A pilot study could reveal areas where the major research project might falter, such as if research protocols aren't being followed or whether proposed methodologies or instruments are inadequate or overly complicated (Nassiuma, 2022). A pilot study of data collection instruments was conducted to check that the items in the questionnaire are stated clearly, have the same meaning for target respondents, and provide the researcher with an estimate of how long it will take to complete the questionnaire.

According to (Green, 2021) It is utilized to improve the validity and relevance to the study objectives.

The lessons learned for improving both research design and data collection processes should be stated openly in the pilot study report. Because the pilot study is considered an essential component of the study protocol (Yin, 2020), the lessons learned from it eventually reflected in the design of the protocol and content (Riege, 2020). A pilot study differs from a pre-test in that the results are utilized to refine the theoretical framework and are included in the case study research findings (Yin, 2020). As a result, it is critical to note that the results of this pilot study were not mixed with the results of the actual case study research, as the main objective of the pilot study is to test a hypothesis.

For the purpose of this study, the pilot study was conducted by purposively selecting 14 respondents from the target population. These managers were not be part of the sample while collecting data on a large scale. The questions that had errors, omissions, ambiguous and irrelevant were re-defined and the questionnaire content, structure, and sequence were structured restructured to enhance the content validity and reliability. These improvements made the data collection instruments precise.

3.9.1 Validity of the Research Instruments

Validity is about the accuracy of the data obtained in the study in representing the variables of the study (Saunders, 2021). Creswell and Garrett (2020) defined validity as to how well an instrument measures what it is intended to measure. The study used open-ended and close-ended questionnaires with Likert scale; another important feature is the population for which the measure is intended, once some of these decisions are made and a measure is developed.

With the support of university supervisors and pilot testing, this study verifies the validity of the research instrument. To guarantee that the items in the questionnaire

yielded reliable data, the following methods were implemented in this study. Expert opinion: supervisors' comments were incorporated into the instruments to improve their validity; a pre-test study was conducted among the supply chain managers.

Factor analysis: A validity test was performed on the research instrument, and the components were extracted using the Principal Component Analysis (PCA) method. For research with a sample size of less than 200, factor loadings greater than 0.40 are deemed statistically significant (Chou, 2020). As a result, because the sample size is 201, 0.40 was chosen as the loading cut-off in this investigation. The higher the factor loadings, the more related to the variable they are.

3.9.2 Reliability of Research Instrument

According to Creswell and Garrett (2020) the consistency of measurement is defined as the degree to which a research instrument yields consistent results or data after repeated trials; reliability is defined as the consistency of measurement. According to the Researcher, the more reliable a data collection instrument is, the more consistent the measure is. The degree to which a test consistently assesses whatever it measures is called reliability; in this study, the internal consistency of the variables to be measured was determined using Cronbach's coefficient alpha technique.

$$\alpha = \frac{K * r}{1 + (K - 1) * \acute{r}}$$

Where:

K is the number of variables,

r- the bar is the average correlation among all pairs of variables.

3.10 Data Analysis and Presentation

The researcher collected questionnaires, coded them and entered them into the Software Package for Social Sciences (SPSS version 26) for analysis. The sort function were used

to perform the initial screening. The data was based on the study's objectives and research hypothesis. The descriptive statistical techniques of frequency, mean, and standard deviation was used to analyze the quantitative data acquired. The results were displayed using frequency distribution tables, which keeps track of how many times a score or response appears. Qualitative data collected was analysed using content analysis and presented in prose form.

Inferential statistics including regression and correlation analysis was used in the study. According to Saunders *et al.* (2022), correlation is a statistical tool that helps to determine the relationships between two or more variables. Cooper and Schindler (2022) indicate that correlation, as measured by a correlation coefficient, is the degree to which a linear predictive relationship exists between random variables. Pearson correlation coefficient was used for testing associations between the independent and the dependent variables. According to Wagana (2022), a correlation coefficient (r) have two characteristics, strength and direction. The strength of the relationship is indicated by how r tends toward 1, the maximum value possible. r is interpreted as follows; when r = +1 it means there is perfect positive correlation between the variables, when r = 0 it means there is no correlation between the variables, that is the variables are uncorrelated, when r = -1 it means there is perfect inverse correlation between the variables.

A multiple regression model was used to test the significance of the influence of the independent variables on the dependent variable. Multiple regression analysis was used to determine how supply chain security management influence supply chain performance of ministry of roads and transport construction agencies in Kenya. Regression analysis attempts to determine whether a group of variables together predict a given dependent variable and, in this way, attempts to increase the accuracy of the estimate (Mugenda & Mugenda, 2020). The use of regression model is ideal due to its ability to show whether a positive or a negative relationship exists between independent and dependent variables (Mason, Lind, & Marchal, 2020).

Statistical Model

The multiple regression equation model is illustrated below: -

$Y= \beta_0+ \beta_1X_1+\beta_2X_2+ \beta_3X_3+ \beta_4X_4+e$

Where:

Y is the dependent variable (performance),
β_0 is the constant (Co-efficient of intercept)
β_1, β_2, β_3, and β_4 are beta coefficients,
X_1 is freight security management,
X_2 is facility security management,
X_3 is information security management,
X_4 is resource security management
e is an error term

Moderator is a variable that affects the direction and the strength of the relationship between an independent or predictor variable and a dependent criterion variable (Baron & Kenny, 2022). This variable may reduce or enhance the direction of the relationship between a predictor variable and a dependent variable, or it may change the direction of the relationship between the two variables from positive to negative (Baron & Kenny, 2022; Lindley & Walker, 2021). The moderating variable in the study is the legal structure on the independent variable and the outcome variable.

Hierarchical multiple regression was utilized to evaluate the moderating influence of legal structure on the link between the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. This helped to decide whether to accept or reject hypotheses. In this study, the test for moderation entails examining the interaction impact between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya and assessing the

significance or insignificance of the resulting effect. This study used multiple regressions analysis (stepwise method) to establish the moderating effect of legal structure (Z) on relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. Model 1.2 was used to test the joint moderating effect.

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta zZ + \beta izXiZ + \varepsilon$, (i=1, 2, 3, 4)…....……....1.2

X_iZ_i is the interaction between the moderator (legal structure with each of the independent variables (X_1, X_2, X_3, X_4).

BZi is the coefficient of X*Z the interaction term between the moderator and each of the independent variables for i = 1,2,3,4;

β_0 is constant (Y- intercept) which represent the value of Y when X =0

3.10.1 Diagnostic Tests

When the assumptions of the linear regression model are correct, ordinary least square (OLS) provides efficient and unbiased estimates of the parameters (Long & Ervin, 2020). Independent variables were subjected to the following tests: linearity, multicollinearity, normality, homoscedasticity before regression analysis were conducted.

3.10.1.1 Linearity Test

For linear regression, the association existing between the response and the predictor variables should be linear. It's very crucial that the study checks for outliers because linear regression is sensitive to the effects of outlier (Creswell, 2020). When the value of sig. deviation from the linearity > 0.05, then in the multiple regression model it can be said that the predictor variables have significant effect on the response variable. If the

value sig. deviation from linearity is < 0.05, then the relationship between the predictor with the response variable is said to be partially significant.

3..10.1.2 Multicollinearity Test

Multicollinearity was addressed using the Variance Inflation Factor (VIF) on the variance of the estimators. This is expressed as $VIF = 1/(1-R^2)$. The general rule is that values greater than ten suggest presence of multicollinearity (Chatterjee & Hadi, 2020). If multicollinearity is detected, the remedy was to collect more data or drop off some of the correlated variables. The key limitation of multicollinearity is that it can yield to unstable regression coefficients characterized by large standard errors and high variances, which can then lead to inaccurate statistical inferences (Bergmann & Hohenboken, 2021).

3.10.1.3 Normality Test

To test for normality assumptions, the study adopted improved Shapiro-Wilk test. The improved Shapiro-Wilk test is a test for normality in regression studies which is normally preferred because of its superb power properties (Mendes & Pala, 2022). The test basically yields a value W which lies between zero and one. A value of one indicates normality whereas weak values indicate a departure of normality (Nornadiah & Yap, 2022). This study in principle, sticked to this stated convention of interpreting normality.

3.10.1.4 Heteroscedasticity

Heteroscedasticity in a study usually happens when the variance of the errors varies across observation, (Long & Ervin, 2021). Breusch-Pagan and Koenker test was used to test the null hypothesis that the error variances are all equal versus the alternative that the error variances are a multiplicative function of one or more variables. Breusch-Pagan and Koenker test the null hypothesis that heteroskedasticity not present (homoskedasticity) if sig-value is less than 0.05, reject the null hypothesis. A large chi-

square value greater than 9.22 would indicate the presence of heteroscedasticity (Sazali, Havehida, Jegak & Raduan, 2022).

3.10.2 Test of Hypotheses

This study tested the validity of the multi regression models using ANOVA and F distribution as proposed by (Mason *et al.,* 2022). ANOVA is also the data analysis procedure that is used to determine whether there are significant differences between two or more groups or samples at a selected probability level (Mugenda & Mugenda, 2022). To test the significance of regression coefficient, T test was performed (Mason *et al*, 2022). The study performed individual tests of all independent variables to determine which regression coefficient may be zero and which one may not. The conclusion was based on the basis of p value where if the null hypothesis of the beta is rejected then the overall model is significant and if null hypothesis is not rejected the overall model is insignificant. In other words if the p-value is less than 0.05 then the researcher concluded that the overall model is significant and have good predictors of the dependent variable and that the results are not based on chance. If the p-value is greater than 0.05 then the model is not significant and cannot be used to explain the variations in the dependent variable. The decision rule was summarized in Table 3.3

Table 3.3: Hypotheses Test

Hypotheses statement	Hypothesis test	Decision rule
H_{01}: Freight security management have no significant influence on the supply chain performance of ministry of roads and transport construction agencies in Kenya	Karl-Pearson's coefficient of correlation -F-test (ANOVA) -T-test	Reject H01 if P- value ≤ 0.05 otherwise fail to reject H01 if P is > 0.05
H_{02}: Facility security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya	Karl-Pearson's coefficient of correlation -F-test (ANOVA) -T-	Reject H02 if P- value ≤ 0.05 otherwise fail to reject H02 if P is > 0.05
H_{03}: Information security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya	Karl-Pearson's coefficient of correlation -F-test (ANOVA) -T-test	Reject H02 if P- value ≤ 0.05 otherwise fail to reject H03 if P is > 0.05
H_{04}: Resource security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya	Karl-Pearson's coefficient of correlation -F-test (ANOVA) -T-test	Reject H04 if P- value ≤ 0.05 otherwise fail to reject H04 if P is > 0.05
H_{05}: Legal structure have no significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya	Karl-Pearson's coefficient of correlation -F-test (ANOVA) -T-test	Reject H05 if P- value ≤ 0.05 otherwise fail to reject H05 if P is > 0.05

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

In this chapter, the response rate, data coding and cleaning are comprehensively described. Equally, the factor analysis of the measures of variables is done. Consequently, the research results which were presented using a variety of inferential and descriptive statistics that highlighted the major characteristics of the data and tested the study's hypotheses are as well presented.

4.2 Response Rate

The study selected a sample of 201 procurement and supply chain managers working with the three road agencies in Kenya; that is KeNHA, KeRRA, and KURA. The selected sample was issued with questionnaire out of which 186 were completed and returned representing 92.5% response rate. Lawoko (2022) posits that a response rate of 50% is sufficient for analysis and reporting while a response rate of 60% is good. A response rate of 70% and above according to the researchers is excellent. The response rate for this study was therefore satisfactory to make inference and conclusions.

Table 4.1: Response Rate

Questionnaire	Frequency	Percent
Returned	186	92.5
Non returned	15	7.5
Total	**201**	**100.0**

4.3 Pilot Study Results

Structured Questionnaires were the major data collection tool used to collect data on the following predictors: freight security management, facility security management, information security management, resource security management, legal structure and performance. The questionnaire was pre-tested before being used for actual data collection procedure. This approach helped the researcher to minimize on wrong answers due to misinterpretation of questions or blanks in questionnaires due to respondents misunderstanding of questions. Further pilot tests were used to test the validity and reliability testing of the data collection instrument. The questionnaire was pilot tested on 10% of the members of the sample size. These were 20 respondents. Cooper and schindler (2021) argue that the respondents in a pilot test do not have to be statistically selected. A 5-10% of the population is sufficient for a pilot. In line with this argument, a pilot test on 20 (10% of the target population) was hence sufficient for this study.

4.3.1 Reliability of Research Instruments

Cronbach Alpha coefficient – which ranges between 0 and 1 was used to test reliability of the data collection instrument. The less variation the instrument produces in repeated measurements of an attribute; the higher the reliability. An instrument is considered reliable when the Cronbach Alpha coefficient is 0.7 and above. When there is a higher alpha coefficient values, then it means there is more reliability of the instrument (Lewis, 2021). A questionnaire with a good internal consistency should have high alpha coefficients. For the purpose of this study, Reliability analysis was used to assess internal consistency among the variables of study. The reliability of the study measures was assessed by computing Cronbach's Alpha coefficient for all items in the questionnaire and the overall assessment was given.

All the items that returned a Cronbach's alpha coefficient of 0.7 or more were considered reliable. The Cronbach summary of reliability results of all predictors as

illustrated in table 4.2 clearly show that the Cronbach Alpha Values of the predictors in the study have a figure which is more than 0.7. Based on the results, facility security management (α = 0.901) had the highest score among the variables followed closely by resource security management (α = 0.840), freight security management (α = 0.813), legal structure (α = 0.751) and information security management (α = 0.736). This shows that the instrument for data collection was generally reliable.

Table 4.1: Reliability Analysis

Variable	Cronbach's Alpha	Number of questions	Decision	Conclusion
Freight Security Management	0.813	9	> 0.7	Reliable
Facility Security Management	0.901	9	> 0.7	Reliable
Information Security Management	0.736	9	> 0.7	Reliable
Resource Security Management	0.840	9	> 0.7	Reliable
Legal Structure	0.751	9	> 0.7	Reliable

4.3.2 Validity of the Research Instrument

In this study, both face and construct validity were tested. Face validity is not scientific type of validity and aims to look at the concept of whether the test looks valid or not on its surface. Face validity done by using the appointed supervisors and other research expert opinion who confirmed the validity of the final document. Construct validity on the other hand measures the extent to which an instrument accurately measures a theoretical construct that it is designed to measure the construct validity was made on the sources of secondary data to confirm their relevance to the study and if data was from the right source. Validity of primary data was done by using subjects from firms who are not part of the directors' appointees.

The construct validity was carried out through factor analysis using a method of exploratory factor (EFL) analysis to extract the factors. The threshold for good construct validity is 0.4 as suggested by some experts (Seltman, 2022). For the purpose of this study, 0.4 (as a threshold) was adopted. In this study the factor loadings were above the threshold of 0.4 for construct validity to further mean that the constructs were

quite appropriate for this study. The construct validity results also showed that for all the items, exploratory factor loading (EFL) was above 0.4. Based on these results, the study concludes that all the instruments were valid and therefore adopted for final data collection.

4.4 Demographic Information Analysis

This section is about general information about the respondents and the organizations they worked in. The study sought information on length of time working with road construction projects and the highest level of education. The findings are presented and discussed in sub-sections below.

4.4.1 Respondents Length of Time Working with Road Projects

The study sought to establish the length of time the selected respondents had worked with road construction projects. Figure 4.1 presents the findings obtained. It was observed that 43% of the respondents had been working with road construction projects for 4-10 years, 29% indicated less than 4 years while 28% had more than 10 years' experience working with road and transport construction projects. These findings show that the selected respondents had diverse years of experience in the road construction projects. They had however served for quite some time and had the necessary experience to provide the needed information that addressed the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. According to Northouse, (2021) that career experiences have a significant impact on a managers characteristics and competencies. Career experiences advance one's job growth and skill building necessary for effective leadership

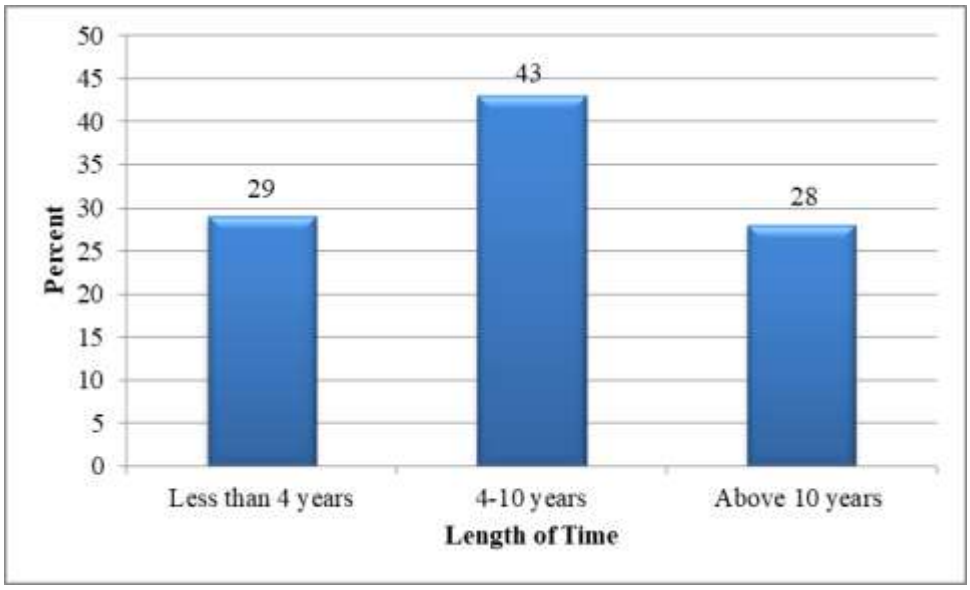

Figure 4.1: Respondents Work Experience

4.4.2 Respondents Level of Education

The level of education may offer an insight to the kind of expertise the management have in enhancing project performance. The study therefore sought to determine the respondent's level of education. The results were as depicted in Figure 4.2. It was observed that 70% of the respondents had university level as their highest level of education while the remaining 30% had college level. It's observed that all the respondents had high educational qualification and therefore had the needed expertise for the position they held. This agrees with Gruzina, Irina and Wadim (2021) who posits that higher levels of education and skills argue for improved productivity that attracts better economic returns.

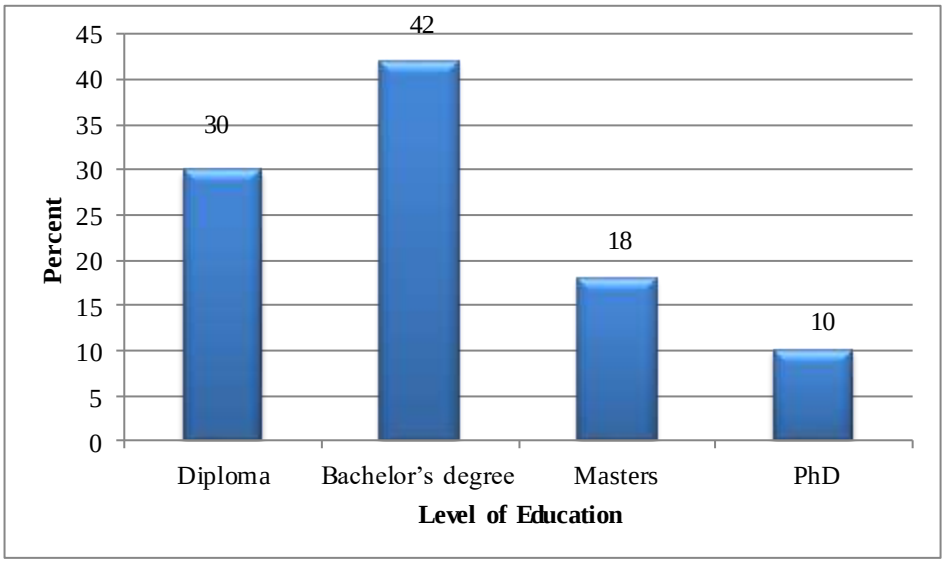

Figure 4.2: Respondents Level of Education

4.5 Descriptive Analysis

The purpose of descriptive analysis is to give background to the study before carrying out analysis. In this section the study presents findings on Likert scale questions where respondents were asked to indicate their level of agreement with various statements on the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. They used a 5-point Likert scale where 1-strongly disagree, 2-disagree, 3-moderate, 4-agree, 5-strongly agree. The means and standard deviations were used to interpret the findings where a mean value of 1-1.4 was strongly disagree, 1.5-2.4 disagree, 2.5-3.4 neutral, 3.5-4.4 agree and 4.5-5 strongly agree. Frequencies and percentages were also used to describe the findings obtained.

4.5.1 Freight Security Management and Performance

The first objective of the study was to establish the influence of freight security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. This section presents descriptive findings on freight

security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. On Liker scale questions, respondents were asked to indicate how far they agree or disagree with the statement by ranking your answer in the scale of 1-5. Table 4.3 presents summary of the findings.

The findings show that cargo safety measures are effective in preventing theft and damage to freight during transportation (M= 3.982, SD= 0.375); that the Ministry of roads and transport construction agencies in Kenya have adequate measures in place to ensure the safety of cargo during transportation (M= 3.948, SD= 0.34); and that the Ministry of roads and transport construction agencies in Kenya takes the necessary steps to prevent cargo theft (M= 3.889, SD= 0.377). The findings also show that freight tracking ability is important for supply chain performance (M= 3.863, SD= 0.36); that the Ministry of roads and transport construction agencies in Kenya have a reliable system for tracking cargo during transportation (M= 3.836, SD= 0.33); and that the Ministry of roads and transport construction agencies in Kenya provides accurate and timely updates on the location of freight (M= 3.777, SD= 0.345). The respondents also agreed that traceability is important in ensuring supply chain performance (M= 3.738, SD= 0.361); and that the Ministry of Roads and transport construction agencies in Kenya have accurate and timely updates on the location of cargo (M= 3.698, SD= 0.358). The results also showed that the Ministry of Roads and Transport construction agencies in Kenya have detailed records of their cargo's movement from origin to destination (M= 3.678, SD= 0.497).

The findings therefore show that the respondents were of the opinion that freight security management have significant influence on the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya, as supported by an aggregate mean score of 3.838 (SD=0.349). The findings agree with those of Yang and Wei (2021) that freight security management has significant positive effects on safety performance, whereas partner relationship management had a significant positive effect on customs clearance performance. It also agrees Kye, Lee, and Lee (2022) that crucial security management dimensions include: facility and cargo management; accident

prevention and processing; information management and partner relationship management. Fries, Chowdhury, and Brummond, (2022) established that transport supply security has gained importance as international economies have embarked progressively on economic and secure supply chains that span the world.

Table 4.3: Descriptive Statistics for Freight Security Management

Statements	Mean	Std. Dev.
Cargo safety measures are effective in preventing theft and damage to freight during transportation	3.982	0.375
The Ministry of Roads and Transport construction agencies in Kenya have adequate measures in place to ensure the safety of cargo during transportation	3.948	0.34
The Ministry of Roads and Transport construction agencies in Kenya take the necessary steps to prevent cargo theft	3.889	0.377
Freight tracking ability is important for supply chain performance	3.863	0.36
The Ministry of Roads and Transport construction agencies in Kenya have a reliable system for tracking cargo during transportation	3.836	0.33
The Ministry of Roads and Transport construction agencies in Kenya provide accurate and timely updates on the location of freight	3.777	0.345
Traceability is important in ensuring supply chain performance	3.738	0.361
The Ministry of Roads and Transport construction agencies in Kenya have accurate and timely updates on the location of cargo	3.698	0.358
The Ministry of Roads and Transport construction agencies in Kenya have detailed records of their cargo's movement from origin to destination	3.678	0.497
Aggregate Score	**3.838**	**0.349**

4.5.2 Facility Security Management and Performance

The second objective of the study was to determine the influence of facility security management on the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya. This section, therefore, presents descriptive findings on the influence of facility security management on the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya. On Likert scale questions, respondents were asked to indicate how far they agree or disagree with the

statement by ranking their answer in the scale of 1-5. Table 4.4 presents a summary of the findings.

The findings show that the Ministry of roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities (M=3.955, SD= 0.872); that the Ministry's facility evaluation process is thorough and effective in identifying and addressing any operational or security issues (M= 3.945, SD= 0.839); and that the Ministry of roads and transport construction agencies in Kenya regularly evaluates the security of their facilities (M=3.932, SD= 0.898). They were also in agreement that the layout of facilities managed by the Ministry of roads and transport construction agencies in Kenya is designed to promote security (M= 3.915, SD= 0.712); and that the layout of the facilities used by the Ministry of roads and transport construction agencies in Kenya are conducive to the efficient movement of goods and materials (M= 3.858, SD= 0.969). In addition the layout of the facilities used by the Ministry of roads and transport construction agencies in Kenya are well-organized and efficient in its use of space (M= 3.823, SD= 0.732); that the facility monitoring practices contribute to the overall efficiency of the supply chain process (M= 3.814, SD= 0.666); and that the Ministry of roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities (M= 3.781, SD= 0.797). The respondents also agreed that the Ministry of Roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities (M= 3.765, SD= 0.872).

Based on the findings as supported by the majority of the respondents, it was evident that facility security management influences the performance of the Ministry of Roads and transport construction agencies in Kenya, as supported by an aggregate mean of 3.828 (SD= 0.898). The study findings agree with those of Harris (2022) that physical security initiatives are the top priorities of organizations. Many organizations are concerned with formal and aesthetic aspects at the expense of attention to security aspects and standards, which may result in a lack of attention to security procedures when designing physical facilities and environments.

Table 4.4: Facility Security Management and Performance

Statements	Mean	Std. Dev.
The Ministry of Roads and Transport Construction Agencies in Kenya has an effective system in place for monitoring the security of its facilities.	3.955	0.872
Ministry's facility evaluation process is thorough and effective in identifying and addressing any operational or security issues	3.945	0.839
The Ministry of Roads and Transport construction agencies in Kenya regularly evaluate the security of their facilities.	3.932	0.898
The layout of facilities managed by the Ministry of Roads and transport construction agencies in Kenya is designed to promote security.	3.915	0.712
The layout of the facilities used by the Ministry of Roads and transport construction agencies in Kenya is conducive to the efficient movement of goods and materials.	3.858	0.969
The layout of the facilities used by the Ministry of Roads and transport construction agencies in Kenya is well-organized and efficient in its use of space.	3.823	0.732
Facility monitoring practices contribute to the overall efficiency of the supply chain process	3.814	0.666
The Ministry of Roads and Transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities	3.781	0.797
The Ministry of Roads and Transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities	3.765	0.872
Aggregate Score	**3.828**	**0.898**

4.5.3 Information Security Management and Performance

The third objective of the study was to establish the influence of information security management on the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya. This section, therefore, presents descriptive findings on the influence of information security management and supply chain performance of the Ministry of Roads and transport construction agencies in Kenya. On Likert scale questions, respondents were asked to indicate how far they agree or disagree with the statement by ranking their answer in the scale of 1-5. Table 4.5 presents a summary of the findings.

From the findings, it is seen that the ministry of roads and transport have the ability to obtain accurate and timely information about the status of transportation routes and cargo (M= 4.007, SD= 0.337); that the ministry uses technology to monitor and track the flow of information within the supply chain (M= 3.988, SD= 0.406); and that the ministry have the ability to identify and respond to potential supply chain disruptions due to information-related issues (M= 3.975, SD= 0.311). They further agree that the ministry effectively controls access to stored information to prevent unauthorized access (M= 3.961, SD= 0.467); that the Ministry regularly updates and backs up important information to minimize the risk of data loss (M= 3.902, SD=0.332); and that the Ministry uses secure storage methods, such as encryption, to protect sensitive information. (M= 3.902, SD= 0.332). Respondents also agreed that the ministry controls access to sensitive supply chain information (M= 3.817, SD= 0.303) and that there are strict security protocols in place to protect the information stored by the Ministry of Roads and transport construction agencies in Kenya (M= 3.764, SD= 0.314). The respondents also agreed that the ministry monitors and tracks who have access to their supply chain information (M= 3.745, SD= 0.376).

From the findings above, it is seen that information security management influences the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya, as supported by an aggregate mean of 3.915 (SD= 0.350). The findings concur with those of Blos *et al*. (2022) that one of the greatest pillars for effective and economical supply chains is that of seamless exchange of knowledge from suppliers, which is attributed to end customers. Some researchers suggest that proper information management may also improve the flexibility of supply chains (Glenn Richey, Skipper, & Hanna 2022). Lee and Özer (2022) find that by timely downstream sharing of information, upstream disruptions may be promptly avoided or their negative consequences minimized. Tomlin (2022) suggests that advance information could be used to deal with certain risks, for instance, labor disputes: if a firm has advance information that a strike is imminent, then mitigation inventory may be built in advance.

Table 4.5: Descriptive Statistics on Information Security Management

Statements	Mean	Std. Dev.
We have the ability to obtain accurate and timely information about the status of transportation routes and cargo	4.007	0.337
We use technology to monitor and track the flow of information within the supply chain	3.988	0.406
We have the ability to identify and respond to potential supply chain disruptions due to information-related issues	3.975	0.311
The Ministry effectively controls access to stored information to prevent unauthorized access.	3.961	0.467
The Ministry regularly updates and backs up important information to minimize the risk of data loss.	3.902	0.332
The Ministry uses secure storage methods, such as encryption, to protect sensitive information.	3.902	0.332
The ministry controls access to sensitive supply chain information	3.817	0.303
There are strict security protocols in place to protect the information stored by the Ministry of Roads and transport construction agencies in Kenya	3.764	0.314
The ministry monitors and tracks those who have access to their supply chain information	3.745	0.376
Aggregate Score	**3.915**	**0.350**

4.5.4 Resource Security Management and Performance

The fourth objective of the study was to evaluate the influence of resource security management on the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya. This section, therefore, presents descriptive findings on the influence of resource security management on the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya. On Likert scale questions, respondents were asked to indicate how far they agree or disagree with the statement by ranking their answer in the scale of 1-5. Table 4.6 presents a summary of the findings.

The findings show that the respondents were in agreement that the ministry have sufficient staff to manage and oversee supply chain operations (M= 3.961, SD= 0.3); that the staff in the Ministry of Roads and Transport is properly trained and qualified to

handle supply chain management responsibilities (M= 3.955, SD= 0.319); and that there are clear and effective system for managing employee performance and accountability (M= 3.902, SD= 0.367). The findings further show that there is a dedicated budget for supply chain security management within the ministry (M= 3.836, SD= 0.325); that financial resources allocated to supply chain security management are regularly reviewed and updated (M= 3.836, SD= 0.333); and that there are systems in place for monitoring and controlling supply chain security management expenses (M= 3.836, SD= 0.356). Respondents further agreed that the organization has a budget allocated for maintaining and upgrading physical resources used in the supply chain (M= 3.83, SD= 0.352); and that physical resources used in the supply chain in their organization are regularly inspected and maintained (M= 3.803, SD= 0.337). The respondents also agreed that their organization has a plan in place for upgrading physical resources as needed (M= 3.798, SD= 0.324).

From the findings above, it was clear that resource security management influences the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya, and this was supported by an aggregate mean score of 3.870 (M= 0.336). The findings agree with Gómez-Cedeño *et al* (2021) that the introduction of professional human resource have a substantial effect on the effectiveness of supply chain performance and a direct impact on the performance of manufacturing firms. Third, managers can optimise the firm's infrastructure in tandem with the right professional human resource strategy and subsequently improve the firm's supply chain performance. It also concurs with Zaida, Jaaronb, and Bonc (2022) that green human resource management and green supply chain management practices have a positive effect on sustainable performance in a joint manner. In fact, the results revealed that green human resource management practices have a direct effect on the sustainable performance, with the green supply chain management practices mediating this effect.

Table 4.6: Descriptive Statistics on Resource Security Management

Statements	Mean	Std. Dev.
The ministry has sufficient staff to manage and oversee supply chain operations	3.961	0.3
The staff in the Ministry of Roads and Transport Construction agencies are properly trained and qualified to handle supply chain management responsibilities	3.955	0.319
There are clear and effective system for managing employee performance and accountability	3.902	0.367
There is a dedicated budget for supply chain security management within the Ministry of Roads and Transport Construction agencies in Kenya	3.836	0.325
Financial resources allocated to supply chain security management are regularly reviewed and updated	3.836	0.333
There are systems in place for monitoring and controlling supply chain security management expenses	3.836	0.356
The organization has a budget allocated for maintaining and upgrading physical resources used in the supply chain	3.83	0.352
Physical resources used in the supply chain in our organization are regularly inspected and maintained	3.803	0.337
Our organization has a plan in place for upgrading physical resources as needed	3.798	0.324
Aggregate Score	**3.870**	**0.336**

4.5.5 Legal Structure and Supply Chain Performance

The fifth objective of the study was to determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of the Ministry of Roads and transport construction agencies in Kenya. This section, therefore, presents descriptive findings on the influence of legal structure and performance of the Ministry of Roads and Transport. On Likert scale questions, respondents were asked to indicate how far they agree or disagree with the statement by ranking their answer in the scale of 1-5. Table 4.7 presents a summary of the findings.

The findings shows that the Ministry of roads and transport construction agencies in Kenya have clear and defined supply chain policies in place for managing the security of the supply chain (M= 4.021, SD= 0.342); that the Ministry of roads and transport construction agencies in Kenya, supply chain policies are effectively implemented and

enforced (M= 3.982, SD= 0.303); and that supply chain policies are aligned with the overall legal framework of the country (M=3.972, SD= 0.332). They were also in agreement that contract implementation teams are established to oversee the implementation of various projects (M= 3.938, SD= 0.315); and that contract digitization has enhanced documentation and administration of supply chain services (M= 3.918, SD= 0.316). Respondents further agreed that performance-based contracting is established to enhance supply chain security (M= 3.902, SD= 0.332); that the ministry has Acts and regulations in place to ensure compliance with supply chain security management (M= 3.836, SD= 0.356); and that the Ministry of Transport in Kenya adheres to the established national laws (M= 3.821, SD= 0.330). The respondents also agreed that the established national laws facilitate the performance in the Ministry of Roads and Transport (M= 3.789, SD= 0.312).

As the findings above have shown, legal structure influences the supply chain performance of the Ministry of Roads and transport construction agencies in Kenya. This was supported by an aggregate mean of 3.881 (SD= 0.328). The findings agree with Ogaga (2022) who demonstrated that legal structure had the impact of further helping managers align employee's assignments based on their abilities and interests, establish efficient information exchange systems within the organization thereby creating the positive impact of increasing the speed and accuracy of execution of operational tasks as well as implementation of long term strategic alignments within the business in the region. In addition, the findings concur with those of Mwangi and Nyaribo (2022), who established that corporate governance structures influences organizational performance of state corporations

Table 4.7: Descriptive Statistics on Legal Structure

Statements	Statements	Mean
The Ministry of Roads and Transport construction agencies in Kenya have clear and defined supply chain policies in place for managing the security of the supply chain	4.021	0.342
In the Ministry of Roads and Transport, construction agencies in Kenya supply chain policies are effectively implemented and enforced	3.982	0.303
Supply chain policies are aligned with the overall legal framework of the country	3.972	0.332
Contract Implementation Teams are established to oversee the implementation of various projects	3.938	0.315
Contract digitization has enhanced documentations and administration of supply chain services	3.918	0.316
Performance Based Contracting are established to enhance supply chain security.	3.902	0.332
The ministry has Acts and Regulations in place to ensure compliance with supply chain security management	3.836	0.356
The Ministry of Transport in Kenya adheres to the established national laws	3.821	0.330
The established national laws facilitate performance in the Ministry of Roads and Transport	3.789	0.312
Aggregate Score	**3.881**	**0.328**

4.5.6 Supply Chain Performance of Ministry of Roads and Transport Construction Agencies

The dependent variable of the study was the performance of the Ministry of Roads and transport construction agencies in Kenya. The respondents were further requested to rate their level of agreement with various statements on the performance of the Ministry of Roads and Transport Construction Agencies in Kenya. Table 4.8 presents a summary of the findings.

The findings show that the Ministry of Roads and Transport construction agencies in Kenya consistently deliver on time. (M= 3.988, SD= 1.064); that the on-time delivery is a priority for the Ministry of Roads and Transport construction agencies in Kenya (M= 3.980, SD= 0.876); and that there are few complaints concerning on-time delivery (M=3.979, SD= 1.158). They were also in agreement that the Ministry of Roads and

Transport construction agencies in Kenya effectively controls costs within the supply chain (M= 3.855, SD= 0.902); and that the Ministry of roads and transport construction agencies in Kenya's supply chain is cost-efficient (M= 3.848, SD= 1.010). Respondents further agreed that they are satisfied with the cost control measures put in place (M= 3.841, SD= 0.983); that the Ministry of roads and transport construction agencies in Kenya maintains a high level of quality assurance throughout the supply chain (M= 3.830, SD= 0.935); and that they are satisfied with the quality control measures put in place (M= 3.765, SD= 0.876). The respondents also agreed that the Ministry of roads and transport construction agencies in Kenya's supply chain consistently meets or exceeds quality standards (M= 3.752, SD= 0.932).

Krause, Handfield and Scannell, (2022) argues that supply chain performance is concerned with the effectiveness and efficiency of an organization's supply chain operations in meeting the needs of its customers and other stakeholders. It encompasses a wide range of factors, including on-time delivery, cost control, and quality assurance, all of which are critical to the success of an organization's supply chain operations. A number of studies have highlighted the importance of supply chain performance in achieving organizational success. According to a study by Li, Wang, and Liang (2022), supply chain performance is positively associated with firm performance, and organizations with better supply chain performance are more likely to achieve higher levels of financial performance and customer satisfaction. The study argues that supply chain performance can improve the efficiency and effectiveness of an organization's operations, and can help to reduce costs and improve customer service

Table 4.8: Descriptive Statistics on Performance

	Mean	Std. Dev.
The Ministry of roads and transport construction agencies in Kenya consistently delivers on time.	3.988	1.064
On-time delivery is a priority for the Ministry of roads and transport construction agencies in Kenya.	3.980	0.876
There are few complaints concerning on-time delivery	3.979	1.158
The Ministry of roads and transport construction agencies in Kenya effectively controls costs within the supply chain.	3.855	0.902
The Ministry of roads and transport construction agencies in Kenya's supply chain is cost-efficient.	3.848	1.010
Am satisfied with the cost control measures put in place	3.841	0.983
The Ministry of roads and transport construction agencies in Kenya maintains a high level of quality assurance throughout the supply chain.	3.830	0.935
Am satisfied with the quality control measures put in place	3.765	0.876
The Ministry of roads and transport construction agencies in Kenya's supply chain consistently meets or exceeds quality standards.	3.752	0.932
Aggregate	**3.854**	**0.913**

4.6 Diagnostic Tests

Diagnostic tests were performed to test the assumptions of linear regression. The assumptions tested were normality, autocorrelation, multicollinearity, homoscedasticity and linear relationship. In case of violation of the regression assumptions, the confidence intervals as well as other scientific insights derived from the regression model may be regarded as misleading, biased or inefficient and therefore the inferences derived incapable of being generalizable on other data

4.6.1 Linearity Test

When the value of sig. deviation from the linearity > 0.05, then in the multiple regression model it can be said that the predictor variables have significant effect on the response variable. If the value sig. deviation from linearity is < 0.05, then the relationship between the predictor with the response variable is said to be partially

significant. In the SPSS output display (Table 4.9), the sig. value of freight security management = 0.663; facility security management = 0.555; information security management = 0.563; resource security management = 0.674 and legal structure = 0.557. In relation to these results, then the appropriate basis for decision making in our multiple linear regression model analysis concluded that there is significant linear relationship between freight security management, facility security management, information security management, resource security management and legal structure with performance. Thus, increasing the effect of the predictors improves the response variable.

Table 4.9: Coefficients of Linearity Test

Model	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		Lower Bound	Upper Bound	Tolerance	VIF
Freight Security Management	.663	-13.627	11.412	.551	1.816
Facility Security Management	.555	-19.784	23.728	.192	5.200
Information Security Management	.563	-21.061	18.506	.163	6.136
Resource Security Management	.674	-10.159	11.100	.600	1.665
Legal Structure	.557	-39.612	45.193	.268	3.734

4.6.2 Normality Test

Data in this study was continuous data and therefore testing of the normality (which was conducted in the statistical software "SPSS") is a crucial step for deciding the measures of central tendency and statistical methods for data analysis. There are different methods used to test the normality of data, including numerical and visual methods. Key requirements for both statistical and graphical methods for testing normality; is that the data are from a normal distribution and that there are no multiple outliers. The visual method otherwise known as graphical method includes Q-Q plots (Quantile - Quantile plots). From the figure 4.3 below it is evident that the data was from a normal distribution since the data points are close to the diagonal line.

Kolmogorov–Smirnov is an ideal numerical test method for this study. When $P > 0.05$, null hypothesis is accepted and data are said to be normally. Table 4.10 below gives test results of all the variables using Kolmogorov–Smirnov test of normality. All the variables (freight security management, facility security management, information security management, resource security management, legal structure and performance) had P- values more than 0.05. As such the study accepts the corresponding null hypothesis respectively and concludes that the data sets for the variables are normally distributed.

Table 4.10: Normality Test

Variables	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Freight Security Management	.139	20	.058	.893	20	.060
Facility Security Management	.128	20	.061	.949	20	.055
Information Security Management	.082	20	.067	.976	20	.052
Resource Security Management	.120	20	.051	.956	20	.063
Legal Structure	.125	20	.053	.873	20	.056
Performance	.105	20	.054	.942	20	.059

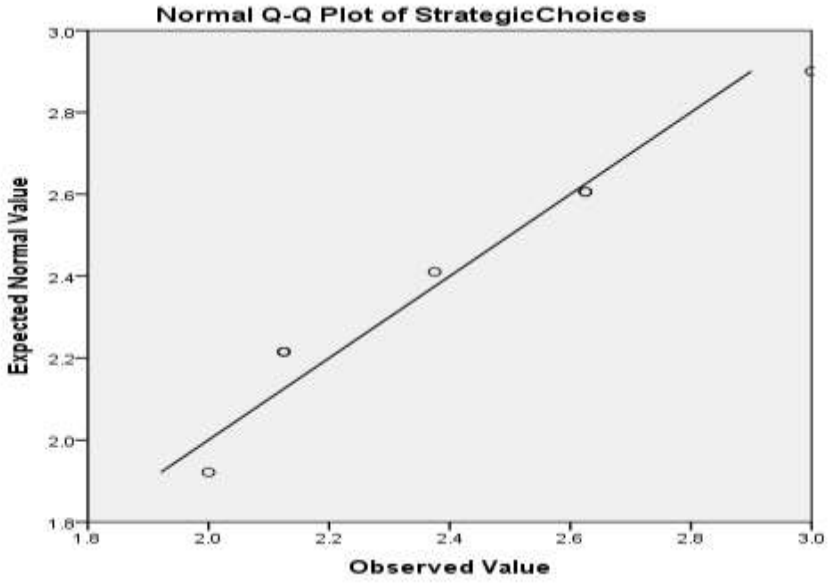

Figure 4.3: Normal Q-Q Plots

4.6.3 Multicollinearity Test

A Variance Inflation Factor (VIF) measures the extent to which multicollinearity have increased the variance of an estimated coefficient. Essentially VIF is a tool to measure and quantify how much the variance is inflated. In other words, it examines the extent to which a predictor variable can be explained by all the other predictor variables in the equation. When there is presence of correlation among predictor variables the standard error of coefficients of the predictors increases and as a result the variance of the predictor's coefficients is inflated. This can be corrected by re-specifying the model. The value of VIF =1 shows that the predictor variables are not correlated to each other. But when the value of VIF is 1< VIF < 5, it shows that the variables are moderately correlated to each other. When the VIF is between 5 to 10 it shows that variables are highly correlated. In other words, a VIF ≥ 5 to 10, there will be multicollinearity among the predictors in the regression model. According to the results in table 4.16 of Regression Coefficients the value of VIF is 1< VIF < 5. This implies that the variables are moderately correlated to each other.

The values corresponding to the variables in the Table 4.11 below are small (<5). Since all the VIF values were below 5, it was found that there was no multicollinearity among the independent variables. This implies that the results of the multiple regression equation are not misleading, since the independent variables in the multiple regression equation are not highly correlated amongst themselves.

Table 4.11: Multicollinearity Test Statistics

Variables	Tolerance	VIF
Freight Security Management	0.788	1.251
Facility Security Management	0.800	1.237
Information Security Management	0.766	1.290
Resource Security Management	0.802	1.263

4.6.4 Heteroscedasticity Test

Violation of homoscedasticity tends to inhibit critical evaluation of forecast errors of standard deviation, which often leads to confidence intervals that are extremely narrow or extremely wide. Homoscedasticity in this study was assessed using the Breusch-Pagan test. The null hypothesis for this test was that the error variances were equal and were a multiple function of variables. Homoscedasticity normally occurs when the chi-square value is greater than the significance level (0.05). As indicated in Table 4.12, the chi-square value was 0.3274, which was greater than the significance level of 0.05. This implies that there was homoscedasticity in the regression model.

Table 4. 12: Breusch-Pagan test for Homoscedasticity

Ho: Constant variance **Variables: Fitted with values of performance**	
Chi2 (1)	0.96
Prob>chi2	0.3274

4.7 Correlation Analysis

The study computed Correlation analysis to determine the strength and the direction of the relationship between the variables being studied. If the correlation values are $r = \pm 0.1$ to ± 0.29 then the relationship between the two variables is small, if it is $r = \pm 0.3$ to ± 0.49 the relationship is medium, and when $r = \pm 0.5$ and above there is a strong relationship between the two variables under consideration. Table 4.13 presents the findings obtained.

The findings show that freight security management and supply chain performance of ministry of roads and transport construction agencies in Kenya have a strong positive and significant relationship ($r= 0.774$, $p<0.05$). The relationship was considered significant since the p-value (0.000) was less than the selected level of significance (0.05). This implies that freight security management have significant effect on supply chain performance of ministry of roads and transport construction agencies in Kenya.

The findings agree with Rice *et al*. (2022), argue that freight security management have significant positive effects on safety performance, whereas partner relationship management had a significant positive effect on customs clearance performance.

Facility security management is also seen to have a positive significant relationship with supply chain performance of ministry of roads and transport construction agencies in Kenya ($r= .869$, $p<0.05$). Since the p-value (.023) was less than the selected level of significance (0.05), the relationship was considered significant. This therefore suggests that facility security management affects supply chain performance of ministry of roads and transport construction agencies in Kenya. The study findings agree with those of Harris, (2022) that physical security initiatives are the top priorities of organizations. Many organizations are concerned with formal and aesthetic aspects at the expense of attention to security aspects and standards, which may result in a lack of attention to security procedures when designing physical facilities and environments.

Information security management is also seen to have a strong positive and significant relationship with supply chain performance of ministry of roads and transport construction agencies in Kenya ($r= .784$, $p<0.05$). Since the p-value (.001) was less than the selected level of significance (0.05), the relationship between the two variables was considered to be significant. The findings concur with those of Blos et al. (2022) that one of the greatest pillars for effective and economical supply chains is that of seamless exchange of knowledge from suppliers which is attributed to end customers. Some researchers suggest that proper information management may also improve the flexibility of supply chains (Glenn Richey, Skipper, & Hanna 2022). Lee and Özer (2022) find that by timely downstream sharing of information, upstream disruptions may be promptly avoided or their negative consequences minimized.

Finally, resource security management is seen to have a positive and significant relationship with supply chain performance of ministry of roads and transport construction agencies in Kenya ($r= .727$, $p< 0.001$). The p-value (.021) was less than the selected level of significance (0.05) suggesting that the relationship between the two

variables was significant. This means that resource security management affects supply chain performance of ministry of roads and transport construction agencies in Kenya. The findings agree with Gómez-Cedeño *et al* (2021) that the introduction of professional human resource have a substantial effect on the effectiveness of supply chain performance and a direct impact on the performance of manufacturing firms. It also concurs with Zaida, Jaaronb and Bonc (2022) that green human resource management and green supply chain management practices have a positive effect to sustainable performance in a joint manner. In fact, the results revealed that green human resource management practices have a direct effect on the sustainable performance, with the green supply chain management practices mediating this effect

Table 4.13: Correlation Analysis

		Performance	Freight Security Management	Facility Security Management	Information Security Management	Resource Security Management Security
Performance	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	186				
Freight Security Management	Pearson Correlation	.774**	1			
	Sig. (2-tailed)	.000				.
	N	186	186			
Facility Security Management	Pearson Correlation	.869**	.261	1		
	Sig. (2-tailed)	.023	.147			
	N	186	186	186		
Information Security Management	Pearson Correlation	.784**	.325	.264	1	
	Sig. (2-tailed)	.001	.168	.078		
	N	186	186	186	186	
Resource Security Management	Pearson Correlation	.727**	.317	.336	.266	1
	Sig. (2-tailed)	.021	.123	.574	.278	
	N	186	186	186	186	186

**. Correlation is significant at the 0.05 level (1-tailed).

4.8 Test of Hypotheses

The study sought to establish the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. To test the hypotheses, the study conducted univariate regression analysis in which supply chain performance of ministry of roads and transport construction agencies in Kenya was regressed on each of the independent variables. The predictive power of the model was based on R^2 while F-statistic was used to determine the fitness of the model at $P < 0.05$. The significance of the study variables was also based on P-values at 0.05 significance level. The following null hypotheses tested were:

H_1: Freight security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya

H_2: Facility security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

H_3: Information security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

H_4: Resource security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

H_5: Legal structure have no significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya.

4.8.1 Test for Hypothesis One

The first specific objective of the study was to establish the influence of freight security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. The associated null hypothesis was that freight security

management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya. A univariate analysis was conducted in which supply chain performance of ministry of roads and transport construction agencies in Kenya was regressed on freight management security.

The R-Squared depicted the variation in the dependent variable that can be explained by the independent variables. The greater the value of R-squared the greater the effect of independent variable. The R Squared can range from 0.000 to 1.000, with 1.000 showing a perfect fit that indicates that each point is on the line. As indicated in Table 4.14, the R-squared for the relationship between freight security management and supply chain performance of ministry of roads and transport construction agencies in Kenya was 0.241; this is an indication that at 95% confidence interval, 24.1% of variation in supply chain performance of ministry of roads and transport construction agencies in Kenya can be attributed to changes in freight security management. Therefore, freight security management can be used to explain 24.1% of changes in supply chain performance of ministry of roads and transport construction agencies in Kenya but there are other factors that can be attributed to 75.9% change in supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4. 14: Model Summary for Freight Security Management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.491[a]	.241	.239	.69655

a. Predictors: (Constant), freight management security

The analysis of variance was used to determine whether the regression model is a good fit for the data. It also gave the F-test statistic; the linear regression's F-test have the null hypothesis that there is no linear relationship between the two variables. From the analysis of variance (ANOVA) findings in Table 4.15, the study found out that that Prob>$F_{1,51}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model as constituted was fit to predict supply chain performance of ministry of roads and transport construction agencies in Kenya. Further, the F-calculated, from the

table (995) was greater than the F-critical, from f-distribution tables (3.892) supporting the findings that freight security management can be used to predict supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.15: ANOVA for Freight Security Management

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.87	1	45.87	995	.000[b]
	Residual	4.735	184	0.026		
	Total	**30.605**	**185**			

a. Dependent Variable: supply chain performance
b. Predictors: (Constant), freight security management

From the results in Table 4.16, the following regression model was fitted.

$$Y = 2.069 + 0.433 X_1$$

(X_1 is freight security management)

The coefficient results showed that the constant had a coefficient of 2.069 suggesting that if freight security management was held constant at zero, supply chain performance of ministry of roads and transport construction agencies in Kenya would be 2.069 units. In addition, results showed that freight security management coefficient was 0.433 indicating that a unit increase in freight security management would result in a 0.433 improvement in supply chain performance of ministry of roads and transport construction agencies in Kenya. It was also noted that the P-value for freight security management coefficient was 0.000 which is less than the set 0.05 significance level indicating that freight security management was significant. Based on these results, the study rejected the null hypothesis and accepted the alternative that freight security management have positive significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.16: Beta Coefficients for Freight Security Management

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.069	.174		11.881	.000
	freight security management	.433	.045	.491	9.723	.000

a. Dependent Variable: supply chain performance

4.8.2 Test for Hypothesis Two

The second objective of the study was to determine the influence of facility security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. The corresponding hypothesis was:

Ho_2: Facility security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

A univariate analysis was therefore conducted to test the null hypothesis. From the model summary findings in Table 4.17, the r-squared for the relationship between facility security management and supply chain performance of ministry of roads and transport construction agencies in Kenya was 0.269; this is an indication that at 95% confidence interval, 26.9% variation in supply chain performance of ministry of roads and transport construction agencies in Kenya can be attributed to changes in facility management security. Therefore, facility security management can be used to explain 26.9% change in supply chain performance of ministry of roads and transport construction agencies in Kenya. However, the remaining 73.1% variation in supply chain performance of ministry of roads and transport construction agencies in Kenya suggests that there are other factors other than facility security management that explain the supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.17: Model Summary for Facility Security Management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.519[a]	.269	.267	.68365

a. Predictors: (Constant), facility security management

The analysis of variance was used to determine whether the regression model is a good fit for the data. From the analysis of variance (ANOVA) findings in Table 4.18, the study found out that that Prob>$F_{1,51}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model as constituted was fit to predict the supply chain performance of ministry of roads and transport construction agencies in Kenya. Further, the F-calculated, from the table (396.58) was greater than the F-critical, from f-distribution tables (3.892) supporting the findings that facility security management can be used to predict the supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.18: ANOVA for Facility Security Management

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	51.159	1	51.159	396.58	.000[b]
	Residual	23.817	184	0.129		
	Total	**74.976**	**185**			

a. Dependent Variable: supply chain performance
b. Predictors: (Constant), facility security management

From the results in table 4.19, the following regression model was fitted.

$$Y = 1.792 + 0.497 X_2$$

(X_2 is facility security management)

The coefficient results showed that the constant had a coefficient of 1.792 suggesting that if facility security management was held constant at zero, the supply chain performance of ministry of roads and transport construction agencies in Kenya would be at 1.792 units. In addition, results showed that facility security management coefficient was 0.497 indicating that a unit increase in facility security management would result in a 0.497 increase in supply chain performance of ministry of roads and transport

construction agencies in Kenya. It was also noted that the P-value for information flow coefficient was 0.000 which is less than the set 0.05 significance level indicating that facility security management was significant. Based on these results, the study rejected the null hypothesis and accepted the alternative that facility security management have negative significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.19: Beta Coefficients for Facility security management

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.792	.188		9.523	.000
	Facility Security Management	.479	.046	.519	10.462	.000

a. Dependent Variable: supply chain performance

4.8.3 Test for Hypothesis Three

The third objective of the study was to establish the influence of information security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. The corresponding hypothesis was:

Ho_3 Information security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

A univariate analysis was therefore conducted to test the null hypothesis. From the model summary findings in Table 4.20, the r-squared for the relationship between information management security and performance of ministry of roads and transport construction agencies in Kenya was 0.215; this is an indication that at 95% confidence interval, 21.5% variation in supply chain performance of ministry of roads and transport construction agencies in Kenya can be attributed to changes in information management security. Therefore, information security management can be used to explain 21.5% change in supply chain performance of ministry of roads and transport construction agencies in Kenya. However, the remaining 78.5% variation in supply chain

performance of ministry of roads and transport construction agencies in Kenya suggests that there are other factors other than information security management that explain the supply chain performance of ministry of roads and transport construction agencies in Kenya

Table 4.20: Model Summary for the Information Security Management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.464[a]	.215	.213	.70838

a. Predictors: (Constant), information security management

The analysis of variance was used to determine whether the regression model is a good fit for the data. From the analysis of variance (ANOVA) findings in Table 4.21, the study found out that that Prob>$F_{1,51}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model as constituted was fit to predict supply chain performance of ministry of roads and transport construction agencies in Kenya. Further, the F-calculated, from the table (271.08) was greater than the F-critical, from f-distribution tables (3.892) supporting the findings that information security management can be used to predict to predict the supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.21: ANOVA for Information Security Management

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40.933	1	40.933	271.08	.000[b]
	Residual	25.602	181	0.151		
	Total	**66.535**	**185**			

a. Dependent Variable: Supply chain performance
b. Predictors: (Constant), information security management

From the results in table 4.22, the following regression model was fitted.

$$Y = 1.808 + 0.469\ X_3$$

(X_3 is information security management)

The coefficient results showed that the constant had a coefficient of 1.808 suggesting that if information security management was held constant at zero, supply chain performance of ministry of roads and transport construction agencies in Kenya would be at 1.808 units. In addition, results showed that information security management coefficient was 0.469 indicating that a unit increase in information security management would result in a 0.469 unit improvement in supply chain performance of ministry of roads and transport construction agencies in Kenya. It was also noted that the P-value for information security management was 0.000 which is less than the set 0.05 significance level indicating that information management security was significant. Based on these results, the study rejected the null hypothesis and accepted the alternative that information security management have positive significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.22: Beta Coefficients for Information Security Management

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.808	.215		8.398	.000
	Information Security Management	.469	.052	.464	9.032	.000

a. Dependent Variable: Supply chain performance

4.8.4 Test for Hypothesis Four

The fourth objective of the study was to evaluate the influence of resource security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. The corresponding hypothesis was:

H_{o4}: Resource security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

A univariate analysis was therefore conducted to test the null hypothesis. From the model summary findings in Table 4.23, the r-squared for the relationship between resource security management and supply chain performance of ministry of roads and

transport construction agencies in Kenya was 0.222; this is an indication that at 95% confidence interval, 22.2% variation in supply chain performance of ministry of roads and transport construction agencies in Kenya can be attributed to resource security management. Therefore, resource security management can be used to explain 22.2% change in supply chain performance of ministry of roads and transport construction agencies in Kenya. However, the remaining 77.8% variation in supply chain performance of ministry of roads and transport construction agencies in Kenya suggests that there are other factors other than resource security management that explain the supply chain performance of ministry of roads and transport construction agencies in Kenya

Table 4.23: Model Summary for Resource Security Management

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.471[a]	.222	.219	.70542

a. Predictors: (Constant), resource security management

The analysis of variance was used to determine whether the regression model is a good fit for the data. From the analysis of variance (ANOVA) findings in Table 4.24, the study found out that that Prob>$F_{1,51}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model as constituted was fit to predict the supply chain performance of ministry of roads and transport construction agencies in Kenya. Further, the F-calculated, from the table (305.64) was greater than the F-critical, from f-distribution tables (3.892) supporting the findings that resource security management can be used to predict to predict the supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.24: ANOVA for Past Strategy on Resource Security Management

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	42.179	1	42.179	305.64	.000[b]
	Residual	25.398	184	.138		
	Total	**67.577**	**185**			

a. Dependent Variable: Supply chain performance
b. Predictors: (Constant), resource security management

From the results in table 4.25, the following regression model was fitted.

$$Y = 2.142 + 0.411\ X_4$$

(X_4 is resource security management)

The coefficient results showed that the constant had a coefficient of 2.142 suggesting that if resource security management was held constant at zero, supply chain performance of ministry of roads and transport construction agencies in Kenya would be at 2.142 units. In addition, results showed that resource security management coefficient was 0.411 indicating that a unit increase in resource security management would result in a 0.411 unit improvement in supply chain performance of ministry of roads and transport construction agencies in Kenya. It was also noted that the P-value for past strategy was 0.000 which is less than the set 0.05 significance level indicating that resource security management was significant. Based on these results, the study rejected the null hypothesis and accepted the alternative that resource security management have positive significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.25: Beta Coefficients for Resource Security Management

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.142	.176		12.185	.000
	resource security management	.411	.045	.471	9.207	.000

a. Dependent Variable: Supply chain performance

4.8.5 Optimal Model

The fifth objective of the study was to determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. Moderation happens when the relationship between the dependent variable and the independent variables is dependent on a third variable (moderating variable). The effect that this variable have is termed as interaction as it affects the direction or strength of the relationship between the dependent and independent variable. To achieve the fifth research objective, the study computed moderating effect regression analysis. This (moderating effect regression analysis) also guided the study in testing the fifth research hypothesis. Legal structure (M) was introduced as the moderating variable.

Ho_5: Legal structure have no significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya.

The model for the moderating effect was:

$$Y=\beta 0+ \beta 1X1*Z+ \beta 2X2*Z+ \beta 3X3*Z+ \beta 4X4*Z+ \varepsilon$$

Where Z is the moderator (legal structure), X1 – X4 are the independent variables

The study combined all the four variables (freight security management, facility security management, information security management, resource security management) to form a new variable X. The study then used stepwise regression to establish the moderating effect of Legal structure (M) on the relationship between independent variable (X) and supply chain performance of ministry of roads and transport construction agencies in Kenya (Y).

From the model summary findings in Table 4.26, the first model for which is the regression between supply chain performance of ministry of roads and transport

construction agencies in Kenya (X) without moderator, legal structure (M) and interaction, the value of R-squared was 0.336 which suggests that 33.6% change in supply chain performance of ministry of roads and transport construction agencies in Kenya can be explained by changes in supply chain security management. The p-value for the first model (0.000) was less than the selected level of significance (0.05) suggesting that the model was significant. The findings in the second model which constituted components of supply chain security management, legal structure and supply chain performance of ministry of roads and transport construction agencies in Kenya (X*M) as predictors, the r-squared was 0.568. This implies that the introduction of legal structure in the second model led to a 0.232 increase in r-squared, showing that legal structure positively moderates supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.26: Model Summary for Moderation Effect

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.580[a]	.336	.334	.65170	.336	150.295	1	184	.000
2	.754[b]	.568	.564	.52727	.232	79.360	3	183	.000

a. Predictors: (Constant), supply chain security management

b. Predictors: (Constant), supply chain security management, legal structure, Interaction (X*M)

From the model summary findings in Table 4.27, the F-calculated for the first model, was 540.95 and for the second model was 479.81. Since the F-calculated for the two models were more than the F-critical, 3.892 (first model) and 2.654 (second model), the two models were good fit for the data and hence they could be used in predicting the moderating effect of legal structure on supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.27: ANOVA for Moderation Effect

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.832	1	63.832	540.95	.000[b]
	Residual	21.675	184	0.118		
	Total	85.507	185			
2	Regression	107.958	3	35.986	479.81	.000[c]
	Residual	13.622	182	0.075		
	Total	**121.58**	**185**			

a. Dependent Variable: supply chain performance

b. Predictors: (Constant), legal structure, freight security management * legal structure, facility security management * legal structure, information security management * legal structure, resource security management * legal structure

Further, by substituting the beta values as well as the constant term from the coefficient's findings for the first step regression modelling, the following regression model will be fitted:

$Y = 1.387 + 0.608 X$

Where X is supply chain security management

The findings show that when supply chain security management is held to a constant zero, the supply chain performance of ministry of roads and transport construction agencies in Kenya will be at a constant value of 1.387. The findings also show that supply chain security management have a statistically significant effect on supply chain performance of ministry of roads and transport construction agencies in Kenya as shown by a regression coefficient of 0.608 (p-value= .000).

By substituting the beta values as well as the constant term from model 2 emanating from the second step in regression modeling the following regression model was fitted:

$Y= 3.876 + 0.220 X + 0.325 M + 0.283 X*M$

Where X is supply chain security management; M is legal structure and X*M is the interaction term between supply chain security management and legal structure.

The findings show that when supply chain security management, legal structure, interaction (X*M) are held to a constant zero, supply chain performance of ministry of roads and transport construction agencies in Kenya will be at a constant value of 3.876. The model also indicated that supply chain security management had a positive and statistically significant effect on supply chain performance of ministry of roads and transport construction agencies in Kenya as shown by a regression coefficient of 0.220 (p-value= 0.002). It is also seen that legal structure had a positive and significant effect on supply chain performance of ministry of roads and transport construction agencies in Kenya as shown by a regression coefficient 0.325. On the other hand, interaction of supply chain security management and legal structure (X*M) also had a positive and significant effect on supply chain n performance of ministry of roads and transport construction agencies in Kenya as shown by a regression coefficient of 0.283 (p-value= 0.000).

It is therefore seen that supply chain security management on its own have 22% effect on supply chain performance of ministry of roads and transport construction agencies in Kenya. However, when interacted with legal structure, it have an effect of 28.3%. This is a clear indication that introduction of legal structure as moderating variable have positive influence on supply chain performance of ministry of roads and transport construction agencies in Kenya. The study therefore rejects the null hypothesis and accepts the alternative that legal structure have significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.28: Beta Coefficients for Moderation Effect

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.387	.194		7.163	.000
	supply chain security management	.608	.050	.580	12.260	.000
2	(Constant)	3.876	1.009		3.841	.000
	supply chain security management	.220	.067	.782	3.284	.002
	Legal structure	.325	.048	.310	6.748	.000
	Interaction (X*M)	.283	.065	1.661	4.357	.000

a. Dependent Variable: Supply chain performance

4.8.6 Summary of Hypothesis Testing

The hypotheses for this study were tested as summarized in Table 4.29 below. On the first hypothesis that freight security management had no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya, it was established that the P-value was 0.000<0.05, thus the hypothesis was rejected. The second hypothesis that facility security management have no significant influence on the supply chain performance of ministry of roads and transport construction agencies in Kenya, the P-value of 0.000<0.05 implied that facility security management had a significant relationship with supply chain performance of ministry of roads and transport construction agencies in Kenya, hence the hypothesis was rejected. This was also the case for the third and fourth hypotheses, where the results revealed that the P-values were less than the standard P-value of 0.05, hence the hypotheses rejected.

Table 4.29: Summary of Hypothesis Testing

Hypothesis	R^2	Beta	P-Value	Decision
H_{O1}: Freight security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya.	0.241	0.433	0.000	Reject the Null Hypothesis
H_{O2}: Facility security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya	0.269	0.479	0.000	Reject the Null Hypothesis
H_{O3}: Information security management have no significant influence on supply chain Performance of ministry of roads and transport construction agencies in Kenya	0.215	0.469	0.000	Reject the Null Hypothesis
H_{O4}: Resource security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya	0.222	0.411	0.000	Reject the Null Hypothesis
H_{O5}: Legal structure have no significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya	0.568		0.000	Reject the Null Hypothesis

4.8.7 Revised Conceptual Framework

From the optimal model, the following revised conceptual framework have been drawn. The conceptual framework shows the flow of variables as per the findings from the overall model. The variables are arranged systematically based on their influence to the dependent variable (performance of ministry of roads and transport construction agencies in Kenya). The variable with the highest Beta coefficient have the strongest influence on the performance. Figure 4.4 shows the revised conceptual framework.

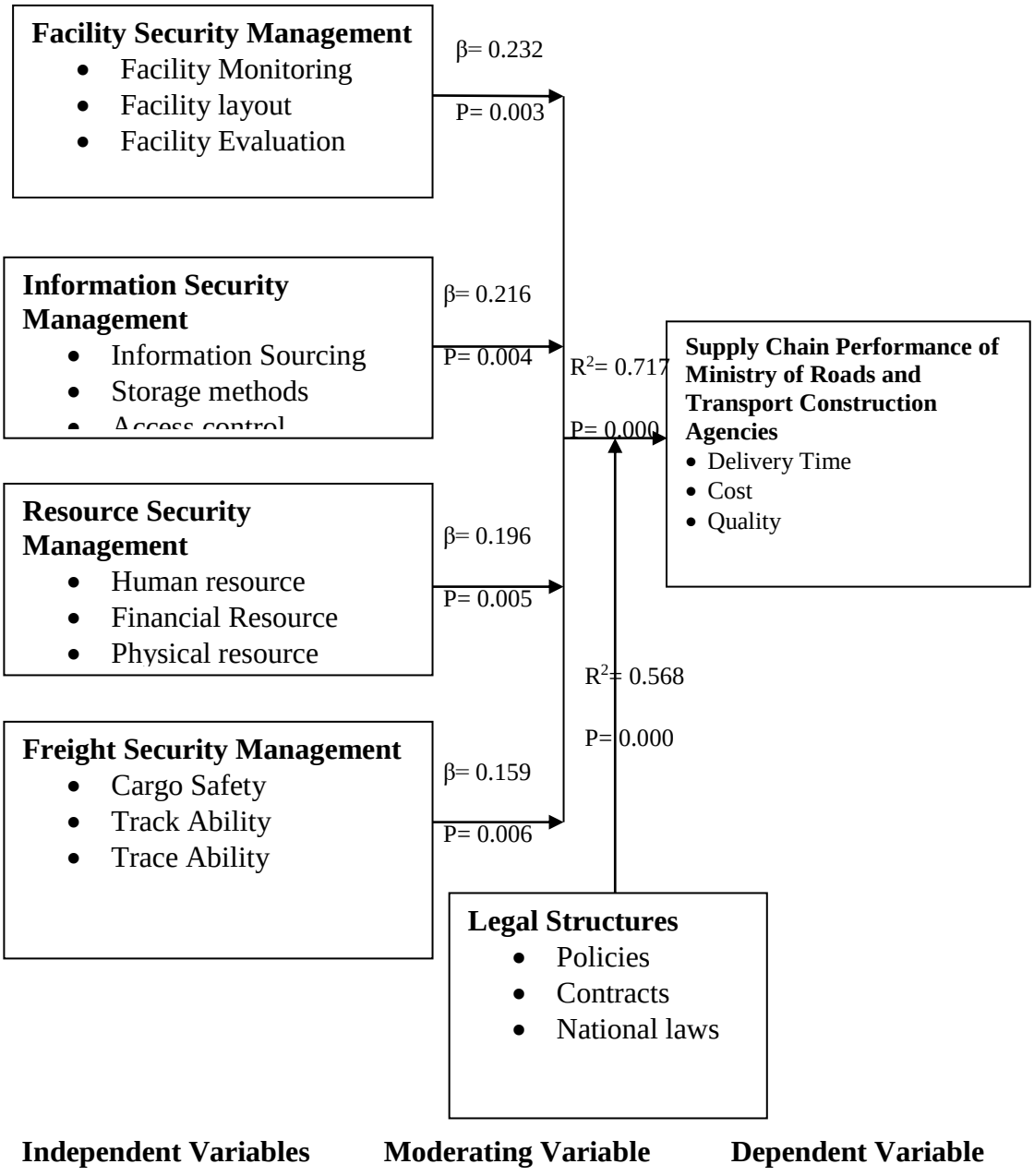

Figure 4.4: Revised Conceptual Framework

4.9 Multiple Regression Analysis

The study aimed to establish the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. To achieve the objective, the study conducted regression analysis to first establish whether there exists some relationship between freight security management, facility security management, information security management, resource security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. Using multiple regression analysis, the study examined the combined effect of independent variables on the dependent variable. The findings were presented in three tables discussed in sub-sections below.

4.9.1 Model Summary

Model summary was used to establish amount of variation in supply chain performance of ministry of roads and transport construction agencies in Kenya that can be explained by freight security management, facility security management, information security management, resource security management. The predictive power of the model was determined using coefficient of determination (R^2). The model summary results in Table 4.30 show that the R-squared is 0.739 which suggests that 73.9% of all variation in supply chain performance of ministry of roads and transport construction agencies in Kenya are explained by changes in freight security management, facility security management, information security management, resource security management. The remaining 26.1% suggests that there are other factors that can be attributed to variation in supply chain performance of ministry of roads and transport construction agencies in Kenya that were not discussed in this study. Correlation coefficient (R) shows the relationship strength between the study variables. From the findings the variables were strongly and positively related as indicated r= 0.859.

Table 4.30: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.859	0.739	0.717	0.26800

a. Predictors: (Constant), freight security management, facility security management, information security management, resource security management

4.9.2 Analysis of Variance

To determine the fitness of the model to predict the dependent variable (supply chain performance of ministry of roads and transport construction agencies in Kenya), the study conducted an F-test at 95% confidence level. The significance of the study variables was determined based on the P-value of the variable coefficients at 0.05 significance level. The decision in the fitness of the model was accepted if p-values was below 0.05 and rejected if it was above 0.05. The findings in Table 4.31 showed that Prob>F 4, 48= 0.000 was less than the 0.05 significance level. This suggested that the model as constituted was fit in establishing the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. Further, the F-calculated, from the table (129.4) was greater than the F-critical, from f-distribution tables (2.422) supporting the findings that freight security management, facility security management, information security management, resource security management can be used to predict supply chain performance of ministry of roads and transport construction agencies in Kenya.

To test the significance of the study variables student t-test was used to establish the amount of influence each freight security management, facility security management, information security management, resource security management had on supply chain performance of ministry of roads and transport construction agencies in Kenya.

Table 4.31: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.353	4	2.588	129.4	.000[b]
	Residual	3.663	181	0.020		
	Total	**14.016**	**185**			

a. Dependent Variable: Supply chain performance

b. Predictors: (Constant), freight security management, facility security management, information security management, resource security management

4.9.3 Beta Coefficients of the Study Variables

From the coefficients in Table 4.32, the following regression model was fitted;

$$Y = 1.481 + 0.159\ X_1 + 0.232\ X_2 + 0.216\ X_3 + 0.196\ X_4$$

Where Y is Supply chain erformance of ministry of roads and transport construction agencies in Kenya*;* X_1 is freight security management; X_2 is facility security management; X_3 is information security management; and X_4 is resource security management.

The findings showed that holding freight security management, facility security management, information security management, resource security management to constant at zero, supply chain performance of ministry of roads and transport construction agencies in Kenya would be 1.481. The constant (β= 1.481) was significant at 0.05 significance level (P=0.000). The findings further showed that freight security management had a coefficient of 0.159 indicating that holding all other factors constant, a unit increase in freight security management would result in a 15.9% increase in supply chain performance of ministry of roads and transport construction agencies in Kenya. The coefficient was significant since the p-value obtained (0.006) was less than the level of significance of 0.05. It was therefore established that freight security management have a positive significant effect on the supply chain performance of ministry of roads and transport construction agencies in Kenya.

Regarding facility security management, it was observed that facility security management had a coefficient of 0.232 suggesting that holding all other factors constant, a unit change in facility security management results in a 23.2% change in supply chain performance of ministry of roads and transport construction agencies in Kenya. This variable was significant since the p-value (0.003) was less than the significance 0.05. Results further showed that information security management have a coefficient of 0.216 indicating that increasing information security management by one unit while holding all other factors constant would result in 0.216-unit increase in supply chain performance of ministry of roads and transport construction agencies in Kenya. This relationship was significant since the p-value (0.004) was less than the 0.05 significance level.

Regarding resource security management, it was noted that resource security management had a coefficient of 0.196 indicating that holding all other factors constant, a unit increase in resource security management leads to a 19.6% improvement in resource security management. The variable was also found to be significant since the p-value (0.005) was less than the selected level of significance (0.05).

Based on the magnitude, all the variables had positive effects with facility security management having the highest positive effect followed by information security management, resource security management and lastly was freight security management. The study finding agree with the findings of Ogunbodede, Ilesanmi, and Olurankinse, (2016) that Supply Chain Security Management influence supply chain performance.

Table 4.32: Beta Coefficients of Study Variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.481	0.201		7.368	.000
	freight security management	0.159	0.068	0.067	2.338	.006
	facility security management	0.232	0.079	0.251	2.937	.003
	information security management	0.216	0.082	0.016	2.634	.004
	resource security management	0.196	0.069	0.126	2.841	.005

a. Dependent Variable: supply chain performance of Ministry of Roads and Transport construction agencies.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter presents the summary, conclusion, and recommendations of the study as per the study hypothesis and in line with the objectives of the study. The main focus of the study was to establish the influence of supply chain security management on supply chain performance of the Ministry of Roads and transport construction agencies in Kenya.

5.2 Summary of Findings

The study presents a summary of findings based on specific objectives of the study. The study was guided by the following specific objectives; to establish the influence of freight security management on supply chain performance of ministry of roads and transport construction agencies in Kenya, to determine the influence of facility security management on supply chain performance of ministry of roads and transport construction agencies in Kenya, to establish the influence of information security management on supply chain performance of ministry of roads and transport construction agencies in Kenya, to evaluate the influence of resource security management on supply chain performance of ministry of roads and transport construction agencies in Kenya and to determine the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya.

5.2.1 Freight Security Management and Supply Chain Performance of Ministry of Roads and Transport Construction Agencies in Kenya

The study found that freight security management have a positive and significant influence on the supply chain performance of ministry of roads and transport

construction agencies in Kenya. The results showed that cargo safety measures are effective in preventing theft and damage to freight during transportation. In addition, the Ministry of roads and transport construction agencies in Kenya have adequate measures in place to ensure the safety of cargo during transportation. Further, the Ministry of roads and transport construction agencies in Kenya takes the necessary steps to prevent cargo theft. The findings also show that freight tracking ability is important for supply chain performance. It was also revealed that the Ministry of roads and transport construction agencies in Kenya have a reliable system for tracking cargo during transportation

Study findings established that the Ministry of roads and transport construction agencies in Kenya provides accurate and timely updates on the location of freight. Further, the respondents also agreed that traceability is important in ensuring supply chain performance. The study also revealed that the Ministry of roads and transport construction agencies in Kenya have accurate and timely updates on the location of cargo. The results also showed that the Ministry of roads and transport construction agencies in Kenya have detailed records of their cargo's movement from origin to destination

5.2.2 Facility Security Management and Supply Chain Performance Ministry of Roads and Transport Construction Agencies in Kenya

The study found that facility security management have a positive and significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya. The findings show that the Ministry of roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities. In addition, the Ministry’s facility evaluation process is thorough and effective in identifying and addressing any operational or security issues. Further, the Ministry of roads and transport construction agencies in Kenya regularly evaluates the security of their facilities. The respondents were also in agreement that the

layout of facilities managed by the Ministry of roads and transport construction agencies in Kenya is designed to promote security

Findings established that the layout of the facilities used by the Ministry of roads and transport construction agencies in Kenya is conducive to the efficient movement of goods and materials. In addition, the layout of the facilities used by the Ministry of roads and transport construction agencies in Kenya is well-organized and efficient in its use of space. Further, the facility monitoring practices contribute to the overall efficiency of the supply chain process. Findings also revealed that the Ministry of roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities. The respondents also agreed that the Ministry of roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities

5.2.3 Information Security Management and Supply Chain Performance Ministry of Roads and Transport Construction Agencies in Kenya

The study found that information security management have a positive and significant influence on the supply chain performance of ministry of roads and transport construction agencies in Kenya. From the findings, it is seen that the ministry of roads and transport have the ability to obtain accurate and timely information about the status of transportation routes and cargo. In addition, the ministry uses technology to monitor and track the flow of information within the supply chain. Further, the ministry have the ability to identify and respond to potential supply chain disruptions due to information-related issues. The respondents further agree that the ministry effectively controls access to stored information to prevent unauthorized access

Findings revealed that the Ministry regularly updates and backs up important information to minimize the risk of data loss. In addition, the Ministry uses secure storage methods, such as encryption, to protect sensitive information. Further, the respondents agreed that the ministry controls access to sensitive supply chain

information. The study also found that there are strict security protocols in place to protect the information stored by the Ministry of roads and transport construction agencies in Kenya. The respondents also agreed that the ministry monitors and tracks who have access to their supply chain information

5.2.4 Resource Security Management and Supply Chain Performance Ministry of Roads and Transport Construction Agencies in Kenya

The study found that resource security management have a positive and significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya. Findings revealed that the ministry have sufficient staff to manage and oversee supply chain operations. In addition, the study found that the staff in the Ministry of Roads and Transport is properly trained and qualified to handle supply chain management responsibilities. Findings also revealed that there are clear and effective system for managing employee performance and accountability. The findings further show that there is a dedicated budget for supply chain security management within the ministry

The study found that financial resources allocated to supply chain security management are regularly reviewed and updated. In addition, there are systems in place for monitoring and controlling supply chain security management expenses. Further, the respondents agreed that the organization have a budget allocated for maintaining and upgrading physical resources used in the supply chain. In addition, the study revealed that physical resources used in the supply chain in their organization are regularly inspected and maintained. The respondents also agreed that their organization have a plan in place for upgrading physical resources as needed

5.2.5 Legal Structure and Supply Chain Performance of Ministry of Roads and Transport Construction Agencies in Kenya

The study found that legal structure have a positive and significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. The findings show that the Ministry of roads and transport construction agencies in Kenya have clear and defined supply chain policies in place for managing the security of the supply chain. In addition, the Ministry of roads and transport construction agencies in Kenya, supply chain policies are effectively implemented and enforced. Further, supply chain policies are aligned with the overall legal framework of the country. The study also found that contract implementation teams are established to oversee the implementation of various projects. Findings also revealed that contract digitization have enhanced documentations and administration of supply chain services.

Respondents further agreed that performance based contracting are established to enhance supply chain security. The study found that the ministry has Acts and regulations in place to ensure compliance with supply chain security management. Findings also revealed that the ministry of transport in Kenya adheres to the established national laws. The study also found that the established national laws facilitate the performance in the Ministry of roads and transport.

5.3 Conclusions

The study conclusions were guided by the findings of the study and were presented in line with objectives of the study

5.3.1 Freight Security Management and Supply Chain Performance of Ministry of roads and Transport Construction Agencies in Kenya

The first null hypothesis test was ‘Freight security management have no significant influence on the performance of ministry of roads and transport construction agencies in

Kenya'. The study found that freight security management is statistically significant in explaining the supply chain performance of ministry of roads and transport construction agencies in Kenya'. The influence was found to be positive. This means that unit improvement in freight security management would lead to an increase in supply chain performance of ministry of roads and transport construction agencies in Kenya'. Based on the findings, the study concluded that freight security management positively and significantly influences supply chain performance of ministry of roads and transport construction agencies in Kenya'.

5.3.2 Facility Security Management and Supply Chain Performance of Ministry of Roads and Transport Construction Agencies In Kenya

The second null hypothesis test was 'facility security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya'. The study found that facility security management is statistically significant in explaining the supply chain performance of ministry of roads and transport construction agencies in Kenya'. The influence was found to be positive. This means that unit improvement in facility security management would lead to an increase in supply chain performance of ministry of roads and transport construction agencies in Kenya'. Based on the findings, the study concluded that facility security management positively and significantly influences the supply chain performance of ministry of roads and transport construction agencies in Kenya'.

5.3.3 Information Security Management and Supply Chain Performance Ministry of Roads and Transport Construction Agencies in Kenya

The third null hypothesis test was 'information security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya'. The study found that information security management is statistically significant in explaining the supply chain performance of ministry of roads and transport construction agencies in Kenya'. The influence was found to be positive.

This means that unit improvement in information security management would lead to an increase in the supply chain performance of ministry of roads and transport construction agencies in Kenya'. Based on the findings, the study concluded that information security management positively and significantly influences the supply chain performance of ministry of roads and transport construction agencies in Kenya'.

5.3.4 Resource Security Management and Supply Chain Performance of Ministry of Roads and Transport Construction Agencies in Kenya

The fourth null hypothesis test was 'resource security management have no significant influence on supply chain performance of ministry of roads and transport construction agencies in Kenya'. The study found that resource security management is statistically significant in explaining the supply chain performance of ministry of roads and transport construction agencies in Kenya'. The influence was found to be positive. This means that unit improvement in resource security management would lead to an increase in the supply chain performance of ministry of roads and transport construction agencies in Kenya'. Based on the findings, the study concluded that resource security management positively and significantly influences the supply chain performance of ministry of roads and transport construction agencies in Kenya'.

5.3.5 Legal Structure and Supply Chain Performance of Ministry of Roads and Transport Construction Agencies in Kenya

The fifth research hypothesis tested was that 'legal structure has no significant moderating effect on the relationship between supply chain security management and the supply chain performance of ministry of roads and transport construction agencies in Kenya'. The study revealed that legal structure is statistically significant in explaining the supply chain performance of ministry of roads and transport construction agencies in Kenya. It was also found that the interaction between legal structure and supply chain security management had positive, statistically significant effect on the supply chain performance of ministry of roads and transport construction agencies in Kenya. Based

on the findings, the study concludes that legal structure has significant moderating effect on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya.

5.4 Recommendations

5.4.1 Recommendations of Policy and Practice

5.4.1.1 Freight Security Management

The study recommends management of the Ministry of Roads and Transport Construction Agencies should invest in enhancing security measures along the supply chain, including better tracking, monitoring, and protection of goods in transit. This could involve using technology such as GPS tracking, secure packaging, and improved surveillance systems. The management should also collaborate with relevant stakeholders, including law enforcement agencies, transport companies, and other government bodies, to share information and coordinate efforts to improve freight management security.

5.4.1.2 Facility Security Management

The study recommends that the management should conduct a thorough security assessment of all facilities and locations within the supply chain. Identify vulnerabilities, potential threats, and weaknesses in the current security infrastructure. This assessment will serve as the foundation for targeted improvements. The management should also enhance surveillance systems within facilities using advanced technology such as CCTV cameras, motion sensors, and alarms. Real-time monitoring can deter security breaches and provide valuable evidence in case of incidents.

5.4.1.3 Information Security Management

Implement strong encryption protocols for sensitive information. Encrypting data both in transit and at rest ensures that even if unauthorized individuals gain access to the data, it remains unreadable and unusable without the proper decryption keys. In addition, ensure compliance with relevant data protection regulations and laws, such as the General Data Protection Regulation (GDPR) if applicable. This includes obtaining proper consent for data collection and ensuring data subjects' rights are respected.

5.4.1.4 Resource Security Management

This study recommends that the ministry of roads and transport construction agencies in Kenya should implement an efficient system for tracking and managing physical assets throughout the supply chain. This includes vehicles, equipment, and infrastructure. Utilize technologies like RFID and GPS to monitor the location and status of these assets in real time. In addition, the ministry should improve inventory management practices to optimize the allocation of resources. It should also implement inventory control systems that ensure accurate tracking of materials, spare parts, and other resources, reducing the risk of shortages or overstocking.

5.4.2 Recommendations for Ffurther Studies

This study was limited to establishing the influence of supply chain security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. The study thus recommends a similar study to be conducted in other ministries such as ministry of health, the ministry of education, the ministry of agriculture etc. Also, legal structure was used as the moderating variable; the study thus recommends the use of a different moderator such as technology since supply chain performance is highly influenced by the level of technology used. Also, the study was limited to four components of supply chain security management which explained 73.9% of all variation in supply chain performance of ministry of roads and transport

construction agencies in Kenya. There is therefore need for a study to be conducted on other factors that can explain the remaining 26.1% variation in supply chain performance of ministry of roads and transport construction agencies in Kenya.

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APPENDICES

Appendix I: Introduction Letter to Respondents

Francis Anyango Okubo

Jomo Kenyatta University of Agriculture and Technology,
P.O. Box 62,000 – 00200
NAIROBI, KENYA
Nairobi, Kenya.

Dear Respondents,

RE: DATA COLLECTION

I am a Doctoral Student from JKUAT pursuing Degree of Doctor of Philosophy In Supply Chain Management. As part of the requirement for award of the degree, I am carrying out an academic research on **SUPPLY CHAIN SECURITY MANAGEMENT AND SUPPLY CHAIN PERFORMANCE OF MINISTRY OF ROADS AND TRANSPORT CONSTRUCTION AGENCIES IN KENYA**. I request you to respond to the questionnaire attached that will allow me to conduct the research. The information you provide is solely for academic purpose and therefore confidentiality and anonymity will be ensured.

Thanks for your willingness to be part in the study.

Yours truly,

Francis Anyango Okubo

Appendix II: Questionnaire

Part A: Demographic Information

Please complete the following biographical information. This information will only be used for statistical purposes.

1. Please state your gender

Male	[ ]
Female	[ ]

2. Please indicate your age bracket

20-29 years	[ ]	30-39 years	[ ]
40-49 years	[ ]	Above 50 years	[ ]

3. State the number of years you have worked with roads construction projects?

Less than 4 years	[ ]	4-10 years	[ ]
Above 10 years	[ ]		

4. Please indicate your level of education

PhD	[ ]	Masters	[ ]
Bachelor's degree	[ ]	Diploma	[ ]
Certificate	[ ]		

Section B: Freight Security Management

Please indicate your level of agreement with the following statements on the influence of freight security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. Please kindly tick (√) in the appropriate space that represents your opinion. Use the scale: **Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5)**

Statements.	**1**	**2**	**3**	**4**	**5**
Cargo Safety					
Cargo safety measures are effective in preventing theft and damage to freight during transportation					
The Ministry of roads and transport construction agencies in Kenya have adequate measures in place to ensure the safety of cargo during transportation					
The Ministry of roads and transport construction agencies in Kenya takes the necessary steps to prevent cargo theft					
Track Ability					
Freight tracking ability is important for performance					
The Ministry of roads and transport construction agencies in Kenya have a reliable system for tracking cargo during transportation					
The Ministry of roads and transport construction agencies in Kenya provides accurate and timely updates on the location of freight					
Trace Ability					
Traceability is important in ensuring performance					
The Ministry of roads and transport construction agencies in Kenya have accurate and timely updates on the location of cargo					
The Ministry of roads and transport construction agencies in Kenya have detailed records of their cargo's movement from origin to destination					

How else do you think freight security management affects the supply chain performance of ministry of roads and transport construction agencies in Kenya?

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Section C: Facility Security Management

Please indicate your level of agreement with the following statements on the influence of facility security management on supply chain performance of ministry of roads and transport construction agencies in Kenya. Please kindly tick (√) in the appropriate space that represents your opinion.

Use the scale: **Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5)**

Statements.	**1**	**2**	**3**	**4**	**5**
Facility Evaluation					
The Ministry of roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities.					
Ministry's facility evaluation process is thorough and effective in identifying and addressing any operational or security issues					
The Ministry of roads and transport construction agencies in Kenya regularly evaluates the security of their facilities.					
Facility layout					
The layout of facilities managed by the Ministry of roads and transport construction agencies in Kenya are designed to promote security.					
The layout of the facilities used by the Ministry of roads and transport construction agencies in Kenya is conducive to the efficient movement of goods and materials.					
The layout of the facilities used by the Ministry of roads and transport construction agencies in Kenya are well-organized and efficient in its use of space.					
Facility Monitoring					
Facility monitoring practices contribute to the overall efficiency of the supply chain process					
The Ministry of roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities					

The Ministry of roads and transport construction agencies in Kenya have an effective system in place for monitoring the security of their facilities					

How else do you think facility security management affects the supply chain performance of ministry of roads and transport construction agencies in Kenya?

……

……

Section D: Information Security Management

Please indicate your level of agreement with the following statements on the influence of Information Security Management on supply chain performance of ministry of roads and transport construction agencies in Kenya. Please kindly tick (√) in the appropriate space that represents your opinion. Use the scale: **Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5)**

Statements.	**1**	**2**	**3**	**4**	**5**
Information Sourcing					
We have the ability to obtain accurate and timely information about the status of transportation routes and cargo					
We use technology to monitor and track the flow of information within the supply chain					
We have the ability to identify and respond to potential supply chain disruptions due to information-related issues					
Storage methods					
The Ministry effectively controls access to stored information to prevent unauthorized access.					
The Ministry regularly updates and backs up important information to minimize the risk of data loss.					
The Ministry uses secure storage methods, such as encryption, to protect sensitive information.					
Access control					
The ministry controls access to sensitive supply chain information					
There are strict security protocols in place to protect the information stored by the Ministry of roads and transport construction agencies in Kenya					

The ministry monitors and tracks who have access to their supply chain information					

How else do you think Information Management Security affects supply chain performance of ministry of roads and transport construction agencies in Kenya?

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Section E: Resource Security Management

Please indicate your level of agreement with the following statements on the influence of Resource Security Management on supply chain performance of ministry of roads and transport construction agencies in Kenya. Please kindly tick (√) in the appropriate space that represents your opinion. Use the scale: **Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5)**

Statements.	**1**	**2**	**3**	**4**	**5**
Human resource					
The Ministry of Roads and Transport construction agencies have sufficient staff to manage and oversee supply chain operations					
The staff in the Ministry of Roads and Transport construction agencies are properly trained and qualified to handle supply chain management responsibilities					
There are clear and effective system for managing employee performance and accountability					
Financial Resource					
There is a dedicated budget for supply chain security management within the ministry					
Financial resources allocated to supply chain security management are regularly reviewed and updated					
There are systems in place for monitoring and controlling supply chain security management expenses					
Physical resource					
The organization have a budget allocated for maintaining and upgrading physical resources used in the supply chain					

Physical resources used in the supply chain in our organization are regularly inspected and maintained					
Our organization have a plan in place for upgrading physical resources as needed					

How else do you think Resource Security Management affects supply chain performance of ministry of roads and transport construction agencies in Kenya?

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Section F: Legal Structure

Please indicate your level of agreement with the following statements on the moderating effect of legal structure on the relationship between supply chain security management and supply chain performance of ministry of roads and transport construction agencies in Kenya. Please kindly tick (√) in the appropriate space that represents your opinion. Use the scale: **Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5)**

Statements.	**1**	**2**	**3**	**4**	**5**
Policies					
The Ministry of roads and transport construction agencies in Kenya have clear and defined supply chain policies in place for managing the security of the supply chain					
In the Ministry of roads and transport construction agencies in Kenya, supply chain policies are effectively implemented and enforced					
Supply chain policies are aligned with the overall legal framework of the country					
Contracts					
Contract Implementation Teams are established to oversee the implementation of various projects					
Contract digitization have enhanced documentations and administration of supply chain services					
Performance Based Contracting are established to enhance supply chain security.					
National Laws					

The ministry have Acts and Regulations in place to ensure compliance with supply chain security management					
The ministry of transport in Kenya adheres to the established national laws					
The established national laws facilitate the performance in the Ministry of roads and transport					

Section G: Performance

Please indicate your level of agreement with the following statements on the supply chain performance of ministry of roads and transport construction agencies in Kenya. Please kindly tick (√) in the appropriate space that represents your opinion. Use the scale: **Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5)**

Statements.	**1**	**2**	**3**	**4**	**5**
On-time delivery					
The Ministry of roads and transport construction agencies in Kenya consistently delivers on time.					
On-time delivery is a priority for the Ministry of roads and transport construction agencies in Kenya.					
There are few complaints concerning on-time delivery					
Cost					
The Ministry of roads and transport construction agencies in Kenya effectively controls costs within the supply chain.					
The Ministry of roads and transport construction agencies in Kenya's supply chain is cost-efficient.					
Am satisfied with the cost control measures put in place					
Quality					
The Ministry of roads and transport construction agencies in Kenya maintains a high level of quality assurance throughout the supply chain.					
Am satisfied with the quality control measures put in place					
The Ministry of roads and transport construction agencies in Kenya's supply chain consistently meets or exceeds quality standards.					

END!!!

Thank You

Appendix III: List of Road Agencies in Kenya

KeRRA
KeNHA
KURA