

**GREEN SUPPLY CHAIN MANAGEMENT PRACTICES AND
OPERATIONAL PERFORMANCE OF PUBLIC UNIVERSITIES
IN KENYA**

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DECLARATION

Student Declaration

This project is my authentic work and has never been submitted for purposes of the award of any degree

Signature 

Date 10/11/2022

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Supervisors' declaration

I approve the submission of this project as the university supervisor.

Signature 

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DEDICATION

I wish to dedicate this thesis project to my lovely wife Harriet Akwissa for the prayers, encouragement, and support, including taking care of our lovely daughters Krista Jepleting Sang, and Kendra Jephumba Sang, during the entire time of the program. Secondly I will not forget my parents Mr. John Kipsang Makai and Mrs. Mary Chepchoge Makai for their prayers, encouragement, and emphasizing the need for education.

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ACRONYMS

CUE	Commission for University Education
GSCM	Green Supply chain Management
NEMA	National Environmental Management Authority
RDT	Resource Dependency Theory
SC	Supply Chains
SCM	Supply Chain Management
ST	Stakeholder Theory

ABSTRACT

Green Supply Chain Management has gained prominence amongst many entities in the recent past as organizations, governments and consumer behavior are now focusing on giving more relevance to environmental issues. As such this has led many organizations to go green in their operations so as to conserve the environment as well as promote ethical behavior in entities. The study sought to investigate the influence of green supply chain management practices on operational performance of Public Universities in Kenya. Three objectives guided the study namely; (i) to ascertain the level of adoption of green supply chain management practices, (ii) to determine the correlation between green supply chain management practices and operational performance and (iii) to determine the challenges faced in the implementation of green supply chain management practices by the Public Universities in Kenya. The study adopted Descriptive research design. The population was made up of all the 32 accredited public universities in Kenya as listed by the Commission for University Education. Primary data was used which was acquired through the use of questionnaires. Drop and pick later as well as use of electronic mails were the mode of administering the questionnaires. Descriptive statistics was used in analyzing objective (i) and (iii) which were measured using Means and Standard Deviations. Regression analysis was used in analyzing objective (ii). On the first objective, it was established that green purchasing, green distribution and supplier integration were adopted to a large extent while eco design and packaging was adopted to a medium extent by the Public Universities in Kenya. on objective (ii) the findings indicate that green supply chain management practices (green purchasing, green distribution, supplier integration and eco design and packaging) has a positive and significant relationship on operational performance (cost, quality and reliability) of Public Universities in Kenya as observed by their respective p values which was lower than five percent. Objective (iii) established that lack of clear statutory regulations, lack of resources for investing in human capital and new technologies, insufficient skilled labor and top management insubordination among the key challenges of implementing GSCMP. It is recommended that green purchasing, green distribution, supplier integration to be adopted to a very large extent with eco design and packaging being adopted to a large extent as it was found to have been adopted to a moderate extent by the Public Universities in Kenya. Future studies should focus on green supply chain management practices which have not been covered by this study as well as carry out the study using another context like in the private sector

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Green Supply Chain Management (GSCM) has gained prominence amongst many entities in the recent past as organizations, governments and consumer behavior in relation to environmental issues has evolved, as such this has led many organizations to go green in their operations (Angela, 2011). The GSCM is seen as cooperation between an organization and its stakeholders in the Supply Chain that lead into inter and intra organizational positive environmental responsibilities (Han & Huo, 2020). To realize its importance, the adoption of GSCM in both internal and external business environments is crucial for the realization of its performance targets (Varsei, 2021). The emergence of GSCM is an important issue in the corporate world because it leads to better outcomes in operational performance as opined by Tarifa-Fernandez and De (2017). Integrating the green practices to the public entities has contributed to better operational performance thus leading to reliable products, cost effective measures, enhanced service delivery and quality processes (Bhatia & Gangwani, 2021).

The study was harbored on three theories expressly the stakeholder theory, Resource dependency theory (RDT) and Systems theory (Mustafa & Irani, 2014). “A company can’t ignore any of its stakeholders and truly succeed” Edward Freeman (1984), Freeman outlines that individuals with an interest in the organization are important in achieving operational performance, and these include suppliers and customers who are among the key persons in the SC as opined by Rane et al., (2020). The RDT stems from sociology and highlights the importance of resources in operational performance of organizations (Morana & Morana, 2013). The Systems theory is particularly important because it underscores the benefits of looking holistically at diverse elements of an elaborate SC to perceive the significance of the external and internal ecosystem of a SC that direct the organizational performance (Caddy & Helou, 2007).

The GSCM is an important factor in public universities because such organizations require huge amounts of resources both tangible and intangible to achieve their operational capabilities (Jelagat, 2012; Huang, 2015.). The public universities employ resources in its supply chain activities and this is managed by the different stakeholders involved. To this end, sustainable use

of resources leads to overall better operational performance (Han & Huo, 2020a; Tarifa-Fernandez & De, 2017). Public institutions of higher learning should thus strive to achieve this. The foregoing demonstrates the crucial element that GSCM plays in achieving operational performance objectives of quality, cost, dependability and speed. Kenyan public universities have undergone growth and changes in the recent past which have led to the realization of the importance of partnerships and linkages in achieving its goals and objectives.

1.1.1 Green Supply Chain Management Practices

Scholarly literature has deliberated on SCM in diverse contexts and ecological aspect of SC devised in literature has increased attention of academicians as environmental concerns have become a key concern (Bhatia & Gangwani, 2021). Scholars' interest in GSC has lately increased as a result of global environmental concerns and climate change. Organizations and governments from various countries have addressed the global issues of climate change and environmental change by implementing green practices (Khan et al., 2022). Recently, environmental issues and supply chain management have been identified as the most thriving issues, and organizations worldwide have focused on reducing their environmental impact (Panpatil et al., 2022). There is a need to discuss GSCM as a result of increased interest on ecological matters in industrialized nations.

In the current contemporary competitive markets, managing supply chain in a Green manner has emerged as a strategic development goal that is sustainable for entities as it is a new innovative approach that enables the achievement of the environmental and financial benefits at the same time elimination of risks to the environment (Mojumder & Singh, 2021). The Practice of GSCM entails a combination of activities that a company makes use of to integrate activities of environmental management across the supply chains through employment of mechanisms that are market based (Bhatia & Gangwani, 2021).

These practices require entities to operate in collaboration with their supplying entities and customers to improve stability in the environment (Khan et al., 2022). The aim is to ensure environmental collaboration by managing the environmental and operational effects of SC activities within the organization and outside the firm (Han & Huo, 2020b; Perdana et al., 2019; Wu, 2013b). The supply chain of public universities has a varied impact on the environment.

These impacts arise from not only component and material purchases but can also incorporate final product and waste disposal. Considering the scale of buying and organization's strategic framework, an array of ecosystem's concerns exist in the SC (Beamon, 1999). The concerns start with the item or product to be sourced, in that the procuring firm would outline the standards and specifications that the product must meet (Gunasekaran, 2015a).

Studies established that the most used GSCM Practices are: purchase of green products, manufacturing of eco-friendly goods, distribution of green natured goods, eco-packaging, marketing of green products, civic education on environmental conservation, management of internal environmental and recovery of investment (Bhatia & Gangwani, 2021; Khan et al., 2022; Panpatil et al., 2022). The GSCM practices which were featured in this project are Green Procurement, Green Distribution, Green Packaging and Supplier Integration

1.1.2. Operational Performance

In supply chains, performance is measured in terms sustainability, which is classified into social, economic and environmental performance. The question to be asked therefore is how it pays to go green (Preuss, 2015; Schmidt, 2017; Wong, 2018) and the effect of the same on operations. Operational performance is the organizations activity measured over the merit or stipulated benchmark of effectiveness, efficiency and environmental standard (what can be termed the three E's) such as waste reduction, cycle time, productivity and conformity compliance. It is also coordinating the inter and intra-organizational processes to ensure improved SC performance of the entire end to end cycle of material flows from purchasing, production, warehousing, distribution and logistics (Tseng et al., 2013). The impact of Ecological SCM can be measured against the environmental, economic and social outcomes.

Environmental performance as argued by Geng (2011) refers the saving of energy while reducing wastes. This means the organization should obtain real-time eco-friendly related information, which helps them identify ecological problems in the right time amongst others. Environmental collaboration has been associated with significant increase in quality improvement in processes. Considering flexibility and innovation as benefits accrued when ecological concerns are integrated into the SC (Zhu et al., 2012). The components of performance namely; quality, cost and reliability arise therefore as a result of employing GSCI in

the firms operations. The question of environmental performance in public universities becomes inevitable for this study and shall be further investigated.

Building strategic relationships with suppliers, distributors and customers and integrating green supply chain initiatives into any undertaking will lead to better performance in operations and sustainability(Ahmad, 2020). This fact ties in with one of the theories such as the stakeholder theory that is important to this study. The application of GSCM is of necessity especially to operational performance since it positively contributes to the overall organizational performance. Yang et al., (2013) finds that supply chain partners' extra-collaboration; in other words stakeholders influences firm competitiveness. The competitive advantage in terms of cost, quality, reliability and innovation are evidenced (Wu, 2013a). On one hand, when we consider cost to customers it translates to product return for reuse and recycling. On the other hand quality of product and service leads to conformance to functional and performance specifications (Keller, 2013). Therefore, to achieve competitive advantage and better organizational performance while taking care of all stakeholders in a public university, GSCM must be incorporated into the processes (Kong et al., 2021).

1.1.3. The Public Universities in Kenya

The public universities in Kenya are amalgamated through an institutional parliament act under the University Act (2012), which virtually guarantees and monitors the development of public university learning, accrediting and governing higher institutions of learning. The universities in the country are governed by the Commission for University Education (CUE), which is a predecessor to the Commission of Higher Education, which was founded by an Act of Parliament in 1985. Universities have a lot of room for expansion, as evidenced by a rise in the number of students, both domestic and international. However, inadequate tutors continue to plague public universities, particularly in specialized units. Furthermore, there has been a challenge to the quality of graduates, who have been accused of not being competent enough to meet the challenges of the job market due to their lack of practicality (CUE, 2016)

Public universities generates economic growth through employment opportunities, creation of innovation and diversification of income generating paradigm through research as well as nurturing the graduates with the hope of the world; solving challenges, unravelling and

harnessing novel knowledge, making political as well as cultural understanding and exhibiting a conducive environment that promoted conversation. Supply chain activities in public entities are characterized by their dynamism. As a public institution, public universities typically receive funding from state grants, donations, bursaries and tuition payment. As a result, a lack of effective and efficient green SCM practices would result in poor performance. There is thus emphasis on efficiency, transparency, accountability in the supply chain process and the operations of these institutions to enhance operational excellence.

The supply chain process in the public universities is directed by Constitution of Kenya (2010) and numerous legal provisions such as the public procurement legislative framework, Universities Act and internal administrative guidelines that are provided periodically (PPADA, 2015). The Institution's supply chain based the department of procurement is mandated with sourcing of works, services and goods for the University. It also coordinates the disposal of inventories, assets, and equipment that are no longer in use, obsolete, or superfluous. The department is governed by the PPADA (2015) and its rules of 2021 in order to carry out the aforesaid function. The University's purchasing function is pegged on the prescribed statutory guidelines, Executive orders, National Treasury circulars, Public Procurement Regulatory Authority circulars, the University financial regulations and other statutes guiding the universities.

An effective procurement function is meant to boost timeliness and an efficient procurement operations (procurement manual Uon 2012). The research work will contribute to a clear comprehending of GSCM's impact on operational performance by looking into integrating green aspects to suppliers, customers and internal organizations environment and how these lead to better quality of processes, cost effective solutions, dependable products and speed of delivery (Mustafa & Irani, 2014).

1.2 Research Problem

Due to globalization, rapid growth of technology, extreme competition, complex distribution and intensely dynamic ecology, there is need for entities to create synergy across and among the supply chain partners through GSCM in order to strive for operational excellence (Odongo, 2017). The effective incorporation of all the supply chain players lead to the realization of a considerable competitive edge resulting to cost reduction, enhanced quality of service provided, flexibility and customer responsiveness which will enhance operational excellence ((Kong et al., 2021).

Public universities have been essential in the country's economy as it has been the link between the problem that the nation is facing and provides solutions to be able to stabilize the economy through the knowledge and problem solving skills impacted to the graduates. Public universities have been faced with challenges in the past including poor green supply chain management strategies resulting in provision of poor service delivery, not engaging suppliers early enough and educate them on green products and innovations, not providing clear specifications pertaining green products and not educating the public on the relevance of environment conservation. Ngigi and Busolo (2019) conclude that the government is also not doing enough to fund the Public universities and enable them fully engage in GSCM. There are also lack of stringent measures and availability of cheap alternatives as some of the GSCM implementation challenges faced by the Public universities (Ambrose, 2017).

Numerous studies have been undertaken that directly link Green Supply Chain strategies and performance. Globally, Khan, Idrees, Rauf, Sami, Ansari and Jamil (2022) studied on GSCM Practices and Operational Performance of Pakistani manufacturing entities. It was ascertained that GSCM practices (eco-manufacturing, eco-design, eco-info system and eco-sourcing) have a positive effect on technological innovation and operational performance. Huma, Siddiqui and Ahmed (2022) on Green SCM practices and operational competitive capabilities established a noteworthy correlation between GSCM and operational competitive capabilities. Panpatil & Kant (2022) on modeling the green supply chain practices (GSCPs) lists eco-design, eco-sourcing, reverse logistics, green innovation, green transportation and green warehousing as the most adopted GSCPs.

Locally, Njuguna (2021) on SCM Strategies and Performance of Medical SC entities in Kenya reveal that performance of medical supply entities was related with SCM strategies. Bor (2021) studied green SCM practices and performance of Food and Beverage Sector. It was noted that Green SCM Practices influences performance of the sector. Nderitu (2021) on GSCMP and performance of Solar Energy entities in Kenya established that there was a correlation between performance and GSCMP in the solar energy firms in Kenya.

From the aforementioned research, it is evident that there gaps on linking Performance to GSC Management at the Public Universities in Kenya. This research aimed at addressing these gaps by answering the subsequent queries: to what extent has Green SCM Practices been implemented by the Public Universities in Kenya? What is the correlation amongst green SCM practices and operational performance the Public Universities in Kenya? What are the challenges faced in implementation of green SCM practices at the Public Universities in Kenya?

1.3 Research Objectives

The study's general goal was to establish the correlation between green SCM and operational performance of public universities.

The following specific objectives guided the study:

- i. To establish the extent of adoption of green supply chain management of public universities in Kenya.
- ii. To determine the correlation between green supply chain management and operational performance among public universities in Kenya.
- iii. To establish the challenges experienced in implementing green supply chain management practices among public universities in Kenya.

1.4 Value of the Study

Greening the SC by integrating customers and suppliers has become a recent graze both locally and internationally. Therefore, the finding will be valuable to the management of the public universities and other organizations in identifying the benefits and challenges accruing from GSCM Practices. Furthermore, the study will aid staff of SC department in public universities in

achieving the benefits of incorporating green supply chain practices into their jobs and ensuring that important stakeholders such as customers and suppliers are aware of their relevance.

The findings can be embraced by state regulatory entities such as the NEMA and the KEBS to establish laws that would guide environmental protection and guarantee supply chains go green in their activities. Furthermore researchers and academics can benefit from the study to do comparative studies, add knowledge and even conduct further studies on the topic of GSCM.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This segment mainly focuses through the theories that the study was anchored on. Literature on operational performance and GSCM was also examined. Furthermore, empirical studies were examined together with the gaps therein.

2.2 Theoretical Review

Resource dependency theory, the stakeholder theory and systems theory were employed as study guides with their discussion expounded in subsequent sections.

2.2.1 Resource Dependency Theory

The resource dependency theory is guided by the idea that a corporation ought to involve other organizations and entities in its surroundings to obtain resources. The theory was founded in the 1970s by Gerald R. Salancik and Jeffrey Pfeffer, who published "the external control of entities: A Resource Dependence Perspective" (1978). The thesis is based on the premise that resources are critical for organizational success and that control and access to resources is a foundation of performance and power (Ajmera and Cook, 2009). An organization's resources may be limited, not always easily available, or controlled by uncooperative units. The resulting unequal exchanges result in future disparities in authority, power, and resource access (Sheu et al., 2011). According to Gerald and Jeffrey (1978), organizations are therefore compelled to negotiate with their external environment in order to secure the resources which they need to survive. This indicates that a company's competitiveness and capacity to implement strategies is decided by how it interacts with its external environment (Weele, 2018).

The commitment of the implementing organization to handle the complex features of inter-firm connections inherent in the SC is critical to the successful integration of environmental efforts into an organization's supply chain (Lee & Klassen, 2008; Sheuet al., 2011). Typically, corporations communicate information with their SC partners, and depending on which side of the organization's dependency stands, this information sharing might become a key resource (Handfield et al., 2017). The RDT views the firm's reliance on other stakeholders, such as suppliers, as critical to its success.

It is vital for suppliers to provide rare green materials or products, for the firm to use the materials or products well and for the customers to effectively use and dispose of the products in the right way as required. According to this theory, partners in the supply chain depend on each other for strategic resources. Therefore, the theory forms the basis of this discussion on GSCM practices especially collaboration and partnerships with suppliers. Though there is avoid of studies associated with GSCM and RDT, this theory will be important for extending this research field and building the knowledge base on understanding inter-organizational behaviors in GSCM.

2.2.2 Systems Theory

This was founded in 1973 by Ludwig von Bertalanffy. He focused on the basic interdependency that exists between various aspects of science (Bowen et al., 2001). The theory postulates that the various ways through which parts of a complex system or process are linked together and their impact on performance of total system or process can be comprehended, analyzed, and improved (Flood and Jackson, 2011). It focuses on creating a link between complex processes and parts of a system and does not reduce a system into its components (Bowen et al., 2001). According to Flood & Jackson (2011), a system is an intertwined and complex component that exhibits synergy whereby the whole is better than a combination of individual components. Bertalanffy challenged the classical views which were founded on mathematical views, and stated that such open systems are always influenced by time (Bowen et al., 2001; Flood and Jackson 2011).

While the balance of trade-offs and cost of service is still a center of attention in any business model, the systems theory offers a shift in organizational focus by describing the role of processes and efficiency of activities within the business chain (which is now referred to as supply chain) (Gripsrud et al., 2006). Any organization is made up of a singular unified system made up of subsystems. The whole system is therefore influenced by internal elements (aspects of subsystems) and external elements being its responsiveness to forces from the external environment (Glinow and McShane, 2014). The integration of green supply chain into any organization involves a reception of input from different systems within it (Gripsrud et al., 2006; Flood and Jackson 2011). This input can be in form of raw materials, information, and supplies.

The process of converting these inputs into finished goods affects not only the integration process but also all systems within the organization (Frohlich & Westbrook, 2001). Therefore, operational performance and success in any organization depends on the interdependence and interaction between subsystems, the synergy between sub-systems, and interactions between internal and external organizational components in the process of GSCM (Flood & Jackson 2011). The theory implies that decisions in one organizational area will impact all the other areas (Das et al., 2006). For instance, if the purchasing department does not implement set GSCM strategies in their input acquisition, the production department won't be able to do the same, eventually impacting the operational performance of entities. For the purpose of this study, a system will consist of an elaborately GSC that perceives the significance of both the external and internal ecosystem which holistically affect the operational performance of an organization; the Public universities in this case.

2.2.3 Stakeholder Theory

The theory, as fronted by economist Friedman Milton in the beginning of the 20th century says that the stakeholder ecosystem involves individuals involved, invested in, or affected by, the organization (Friedman & Miles, 2002). Friedman's theory says that a company's true success is determined by its capacity to satisfy all stakeholders and not just those who might profit from the stock. This theory aims at empowering and helping organizations analyze, identify, and recognize all stakeholders (Sheu & Talley, 2011; Afum et al., 2020). This pushes the management of any organization to streamline their operations so as to create an effective and efficient service delivery to its consumers (Friedman & Miles, 2002). Any organization's performance depends on how responsibly the organization deals with its key stakeholders.

Stakeholder theory is a capitalism view that strains the unified association amongst suppliers, clients, investors, staff, societies and many others with the stake in any firm (Afum et al., 2020). The theory argues that an organization should seek to create value for all its stakeholders, not shareholders. There are a number of ways to consider who are the stakeholders in both an organization and projects undertaken (Sheu & Talley, 2011). Supply chain management operations are responsible for over 90% of the environmental effect, including land and soil, air, and greenhouse gas emissions (Wong et al., 2020). As a result, GSCM practices have become a

popular activity inside enterprises, as it incorporates a holistic approach to guaranteeing environmental conservation throughout the SC (Afum et al., 2020). In doing so, firms need to closely assess and engage the various actors within their supply chains.

The inclusion of these actors, stakeholders, enables a clear direction and focus within the integration process as multiple viewpoints are taken into consideration (Freeman et al., 2010; Sheu & Talley, 2011). The success of GSCM activities strongly depend on the identification and close collaboration with stakeholders. Working together with all stakeholders increases the probability of successful GSCM and strengthens long-term business relations along the way, enhancing opportunities and potentially opening up new avenues of engagement and innovation (Freeman et al., 2010). In order to reduce barriers and enhance drivers for successful GSCM, stakeholders need to be effectively included and managed throughout the process. For this study, stakeholders will be any individual(s) affected by GSCM in the operations of Public universities.

2.3 Green Supply Chain Management Practices

GSCM investigates how well a company interacts strategically with its customers and suppliers, as well as internal operations, to meet environmental criteria (Sheu & Talley, 2011). Through looking into both inter- and intra-organizational processes efficiently and effectively, GSCM's goals include lowering environmental costs or impacts, enhancing resource utilization rates, and achieving operational performance and sustainability in the long run (Han & Huo, 2020).

Due to increase stakeholder pressure and public awareness, existing business relationships are increasingly addressing environmental issues (Han & Huo, 2020). It is intuitive that dealing with these environmental issues collaboratively can be cheaper and more effective if organizations can draw upon coming up with structures of communication, integrated operation frameworks, and reliable decision making strategies (Afum et al., 2020). Therefore, relationship between supply chain components can be interpreted as the capacity that facilitates an extension of collaborative efforts towards addressing environmental issues (Zhou *et al.*, 2020). Ecological practices may be identified as a chance for a business to address any challenges, risks, and operational bottlenecks, ultimately improving an organization's operational performance (Afum *et al.*, 2020).

Organizations always depict these improvements as unintended consequences of a broader integration effort since GSCM exposes organizations to new opportunities and facilitates knowledge diffusion in problem solving (Zaid *et al.*, 2018; Zhou *et al.*, 2020). Common efforts undertaken during GSCM help streamline solutions, reduce costs, and improve environmental growth and performance, which ultimately contribute to operational excellence (Zaid *et al.*, 2018). The practices undertaken during the integration process entail understanding all environmental tasks for every SC stakeholder, working together to eliminate environmental impacts, exchanging technical information to meet environmental regulations by society, and customers, among others (Afum *et al.*, 2020). The GSC Management practices covered by the study include green purchasing, green distribution, eco- design and packaging and supplier integration.

2.3.1 Green Purchasing

Green purchasing, also known as green procurement, is one of the current purchasing trends that involves taking environmental and social aspects into account alongside financial considerations when making any purchase decisions (Afum *et al.*, 2020). Green purchasing is defined as going beyond typical economic parameters to make decisions based on related risks, total cost of ownership, success metrics, and environmental and societal repercussions (Min & Galle, 2011). The drive to improve organizational efficiency, eliminate supply chain bottlenecks, reduce waste, and gain a competitive advantage has prompted businesses to evaluate environmental challenges from a competitive standpoint (Humphreys, 2013). Green purchasing strategies are now being developed and implemented by purchasing organizations and other supply chain stakeholders, with an emphasis on how environmental considerations can be integrated into the purchase process (Foo *et al.*, 2019).

Green Purchasing is about all the activities involved in purchasing of services and products that has little effect on the environment. It puts into consideration both the environment and the health of living beings be it animals or humans by ensuring that they produce products of high quality at affordable prices (Lee & Klassen, 2008). Green Procurement basically entails purchasing of products or raw materials that is environment friendly and has minimal effect on the environment.

The organization that is involved has to measure the effect of the product its purchasing to the environment at all the life cycle stages. For this to happen the following costs has to be considered: disposal, transportation, handling, warehousing and inventory, procuring and lastly the cost of securing the initial raw materials for manufacturing (Lee & Klassen, 2008). Green procurement influences the production of quality products (Walker & Jones, 2012).

2.3.2 Eco-Design and packaging

Eco-design is viewed as a collection of project activities with the aim of creating an eco-efficient production process (Vallet *et al.*, 2013). It is a proactive process that influences all stages of a good's life cycle and involves the identification of environmental aspects related with the product (Cerdan *et al.*, 2009). Karlsson & Luttrupp (2016), defined eco-design as a sustainable solution to production that reduces negative sustainability and positively impacts the economic, environmental, ethical, and social perspectives of a product or service (Das *et al.*, 2006). Design for the environment, clean design, green design and sustainable design are all terms used to describe eco-design (Vallet *et al.*, 2013). It is frequently done early in the product development process to ascertain that the ecological repercussions of the life cycle of goods are thoroughly understood prior to the implementation of production techniques (Das *et al.*, 2006).

Packaging entails how a product is covered and its outside looks as well as the quantity contained in each batch. Packaging affects a products transportation based on its features like packaging material and size. Green packaging entails the use of packaging materials that are eco-friendly and reduced packaging (Ninlawan *et al.*, 2010). Ninlawan *et al.*, (2010) further posits that there is need to collaborate with suppliers in order to have a standardized packaging, encourage the vendors to adopt methods of packaging that incorporates return and reuse and also help in promotion of returned packaging. Green packaging also entails proper labelling of products (Amemba *et al.*, 2013). Labeling of a product plays an important role in ensuring that there is proper communication on how to use the product by its destined users (Hasan, 2013). Eco-labels enlighten the users about products socio-environmental effects, production methods, the products packaging and recyclability ability, the traits that a product possesses or even the content of the product and how to use it (Gunasekaran, 2015).

2.3.3 Green Distribution

Distribution is the product movement from the stage of production to the end customers across the supply chain (Wisner & Stanley, 2007). Distribution entails all the processes that transpire between the retailers, producers, and end users. The main roles of distribution are reverse logistics, physical transportation, labeling, warehousing and storage, and packaging. Green distribution refers to any means of hauling or transporting of goods between suppliers and customers with lowest possible influence on the environmental. It involves the entire process of distribution from the processing of the order, storage, picking of the order, packaging, loading of the truck, delivery to the customer or purchaser and return of packaging (Walker et al., 2008). Green Distribution takes into consideration reduced CO2 emissions, developing products that are friendly towards the environment, and well designed and reduced packaging (Walker et al., 2008).

Sarkis (2009) posits that the characteristics of Green Distribution involves; fulfillment of demand at the right place and time, put into consideration social and ecological aspects and not only economical, ensure complete life cycle of products are sustainable, factor in the reverse logistics aspect, monitoring and improving socio-ecological effects of distribution processes in order to adopt better technology developments and latest opinions of the green term, be competitive without jeopardizing the efficiency of the distribution channels (Walker et al., 2008).

2.3.4 Supplier Integration

Supplier Integration is how the organizations deals with its suppliers through the formation of a good and working relationship between the two parties and involving their suppliers through Early supplier engagement, developing them by funding them, sharing of relevant information with suppliers and training them through seminars and workshops (Walker et al., 2008). For the success of the entity, the firm often consents to form a relationship with its key vendors on a long-term base to achieve financial stability and at the same time have a sustainable relationship (Baenasa et al., 2010). It involves making sure that the suppliers are educated on each and everything that the company requires of them.

This means that the suppliers work closely with the organization to be able to integrate sustainable policies and beliefs into their corporate strategy and their daily operations. The company does this to ensure that there is trust between them and the suppliers which will make them have a shared thinking regarding green and sustainable issues and being able to build one another thus improving the overall performance (Sarkis et al., 2011). Walker and Jones (2012) add that formation of good relationship with the suppliers through supplier integration helps reduce unnecessary cost, improves product quality and enhances speed of delivery of materials to the company.

2.4 Operational Performance Measurements

Operational performance is the organizations activity measured over the merit or stipulated benchmark of effectiveness, efficiency and environmental standard (what can be termed the three E's) such as waste reduction, cycle time, productivity and conformity compliance. Alwashdeh, Adaileh and Ali (2022) stated that there exist 5 operations performance metrics namely cost, quality, speed, dependability and flexibility. Cost is the capacity to manufacture at low cost. Costs are all of the expenses incurred in running a supply chain and ought to be minimized to attain efficiency (Vencataya, Seebaluck & Doorga, 2016). Entities must ensure that overall costs are reduced and saved in any way possible in order to achieve their goals. Quality is the capacity to produce based on specification and devoid of defects. The firm should ensure that the product conforms to specifications (Gavurova & Kubák, 2021).

Speed is the capacity to retort rapidly to client's demands by offering minimal lead times. It considers the timeliness with which materials are delivered to clients as well as the time it takes to complete their orders (Wong, Sinnandavar & Soh, 2021). It ensures that order fulfillment takes as little time as possible, from the time an order is employed to the time it is executed. Dependability is the ability to supply items and services as expected by client's (in a quotation). This is related to the right delivery of the SC to the right clients at the right position, at the exact time, in the right form and the package, in the right quantities, with the right paperwork (Zanon, Ulhoa & Esposto, 2021). Flexibility is the capability to alter processes. If an entity does well at certain operations, the entity is able to strive towards a strategy based on a competitive influence (Vadivel, Sequeira, Sakkariyas & Boobalan, 2021). For the purpose of the study, the quality measures that will be adopted are cost, quality and dependability.

2.5 Challenges of Green Supply Chain Management Implementation

As per Mojumder and Singh (2021), most of the organizations that implement GSCM Practices rarely integrate environmental approaches into their supply chain processes. Insufficient information on GSCM best practices and related metric have left entities handicapped on what to do and implement (Bhatia & Gangwani, 2021). The implementation practices of GSCM can be impacted by several aspects such as no support from the state. According to Khan et al., (2022), government has the ability to improve awareness through improvement in funding, increase training in business and tax policy that enhances initiatives of green supply chains.

According to Panpatil et al., (2022), implementing GSCM require investment in sophisticated technologies and specific skills sets. As such, organizations without these will mean that training programs are put in place for employees which are costly again. Absence of regulations and stringent legislations is an additional barrier in adoption of GSCM in public entities. The other challenge in adoption of GSCMPs is the high initial costs (Huma et al., 2022). Most organizations base their decision to a short-term horizon ignoring the long-term Green Initiatives benefits that would accrue from adopting Green supply chain management practices. It becomes even extra challenging in organizations with limited budgets and prioritization is done on the basis of urgency rather than importance. Some of the initial costs incurred during GSC management include investment in advanced technologies, hiring, training and monitoring employees and making sure they are motivated (Jassim, Al-Mubarak & Hamdan, 2020).

According to Srivastav and Gaur (2015), top management support is key in implementation of GSCMPs and they are responsible for availing sufficient resources in terms of human capital, the technology, promoting effective communication and effectively rewarding and motivating employees to accept GSCMPs in their organizations. The process of GSCM is affected by lack of awareness in the public on the need to return the products that have been used. It can also provide assistance by establishment of return collection points and development of collection points to enhance public participation.

2.6 Empirical Literature Review

An organization may decide to carry out GSCM either internally or externally depending on the set operational performance attributes, which are; quality, speed, dependability, flexibility, and cost (Kaynak & Montiel, 2009; Leuschner *et al.*,

2013). Research has been executed on ecological SCM and performance. Jassim, Al-Mubarak & Hamdan (2020) on green SCM and performance established that eco-sourcing, eco-packaging, eco-production, eco-design and eco-marketing influenced firms performance. Exploratory design was used leaving a gap for descriptive design. Khan, Idrees, Rauf, Sami, Ansari and Jamil (2022) studied on Green Supply Chain Management and Performance of Pakistani production sector. Structural modeling (PLS-SEM) technique was adopted and it was ascertained that GSCM practices (green manufacturing, eco-design, eco-info system and eco-sourcing) significantly impacts both technological innovation and operational performance. There is both methodological and contextual gap as the focus was on manufacturing firms and not universities

Huma, Siddiqui and Ahmed (2022) on GSCM practices and operational competitive capabilities established a noteworthy correlation between GSCM and operational competitive capabilities. Structural equation modeling was adopted. Operational competitive capabilities were covered and not operational performance. Panpatil & Kant (2022) on modeling the green supply chain practices (GSCPs) adopted literature review and lists eco-design, eco-sourcing, reverse logistics, green innovation, green transportation and green warehousing as the most adopted GSCPs. Secondary data was embraced leaving a gap for primary.

Njuguna (2021) on SCM Strategies and Performance of Medical SC entities in Kenya. Descriptive design was used to study 30 medical supply entities in Kenya. The outcome indicates a correlation between performance and SC integration, outsourcing and warehousing. SCM strategies was studied and not GSCM Practices. Bor (2021) studied GSC management and performance of Food & Beverage Processors (F&BP) in Kenya. An explanatory design was adopted in the sampled F&BP entities. It was founded that Green SCM influences performance of F&BP in Kenya. Food and beverage processors were studied leaving a gap for public universities.

Nderitu (2021) on GSCMP and performance of Solar Energy entities in Kenya used a descriptive design on 51 solar energies registered by EPRA and it was established that there was a correlation between performance and GSCMP in the solar energy firms in Kenya. The project concluded that Performance of solar energy companies can be improved by; green procurement, green marketing, green distribution, reverse logistics. Solar energies was the context leaving out a gap in public universities.

Panya, Ochiri, Achuora and Gakure (2021) focused on Sustainable SCM and its impact on performance of sugar sub-sector in Kenya. Descriptive design was used and it was noted that ecological manufacturing and ecological sourcing influenced performance of sugar entities in Kenya in terms of quality, cycle time and utilization of resources. Sustainable SCM was studied and not GSCM practices. Ndung'u (2021) studied SCM Practices and Performance of Milk Processors in Kenya and established a significant correlation amongst strategic sourcing, lean inventory and eco-sourcing and performance of Milk Processors. The study embraced descriptive methodology and census of all the milk processors in Kenya. There is a conceptual gap as SCM Practices was studied and not GSCM Practices.

2.7 Summary of Empirical Literature Review and Knowledge Gaps

Table 2. 1 Summary of Empirical

Author(s)	Study Focus	Methodology	Research Outcome	Research Gap	How gaps are addressed in this study
Khan et al., (2022)	GSCMP and Operational performance	Structural modelling	GSCM Practices influences Operational performance	adopted Structural modelling	Descriptive design was adopted by the current study
Huma et al., (2022)	GSCMP and operational competitive abilities	Structural modelling	GSCM influenced operational competitive abilities	adopted operational competitive abilities	The study focused on Operational performance
Panpatil & Kant (2022)	Modelling GSCM practices	Literature Review	e-design, e-sourcing, green transportation are most adopted	Secondary data was used	Use of primary data
Jassim et al., (2022)	GSCM and Organizational Performance	Exploratory design	GSCM leads to good reputation and customer loyalty	focused on organizational performance	Focus operational performance and descriptive design
Njuguna (2021)	SCMP and performance of Medical firms	Descriptive survey	SCI, warehousing & outsourcing Influences Performance	Focus on SCM practices	Focus on green SCM Practices
Bor (2021)	GSCM and Performance of Food Processors	Explanatory design	GSCM positively influences performance	Focused on food processors in kenya	Focus was on all the Public Universities in Kenya
Nderitu (2021)	GSCM and firms performance of Solar Energy entities	descriptive survey design	green procurement, green marketing, green distribution & reverse logistics influences performance	Focused on organizational performance	Focus on operational performance
Panya et al., (2021)	Sustainable SC & performance of sugar sub-sector	Descriptive cross sectional	Green manufacturing and Green Procurement influenced performance	Covered sustainability as a whole and not	A gap in environmental sustainability and public universities
Ndung'u (2021)	SC management & performance of milk processors	Descriptive design	strategic purchasing, lean inventory and eco-procurement influences performance	Focused on SCM practices	Focus on Green SCM practices

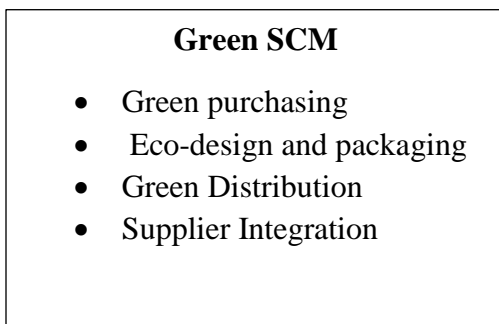
Source: Author (2022)

2.8 Conceptual framework

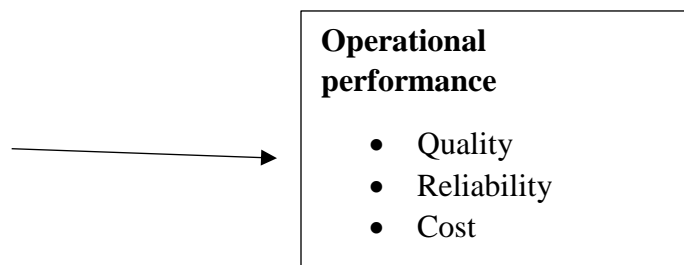
The conceptual model is utilized to depict the study indicators that are measured under each variable in this paper. The study's conceptual model is depicted in Figure 2.1, which aims to ascertain the impact of GSCM on performance.

Figure 2. 1 Conceptual Framework

Independent variables



Dependent Variable.



Source: Author (2022)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This segment provides details on the project's applied methodologies. This comprises the research design and targeted populace. It also includes the procedures of collecting data, the instruments of research and the techniques of analyzing data.

3.2 Research Design

This study made use of descriptive research design. This design was suitable as it described the varied characteristics and data of the population being studied. A descriptive study design is effective for the collection of data on a given population at a given point in time (Babbie, 2013). In line with this study, the effort to ascertain the influence of GSCM on operational performance of public universities in Kenya, the design was suitable.

3.3 Target Population

The population was comprised of all the public universities in Kenya. The universities are being regulated by the Commission for University Education. Based on the Commission for University Education, there are 32 accredited public universities in Kenya (CUE, 2022) as listed in Appendix III. Due to the small and manageable population, Census was carried out.

3.4 Data Collection Techniques

The research made use of questionnaires to obtain primary information from respondents. The study utilized questionnaires designed in line with the research objectives. A single questionnaire was administered to head of supply chain or their equivalent in each public university. Moreover, the questionnaires were distributed on specific dates with the help of assistants. Respondents were given enough time to read and internalize the questionnaires before responding to them. The questionnaire was composed of Four sections as per the objectives of the study. Section A captured data on General information while section B provided statement on the practices of Green Supply Chain Management. Section C gathered data on measures of operational performance. Finally, Section D obtained data on challenges of implementation of GSCM Practices. A Likert scale was employed to standardize the research instruments and make them easy for the researcher to analyze.

3.5 Data Analysis

This research applied data analysis techniques based on linear regression in bringing out the correlation amongst the variables and descriptive statistics to ascertain the extent of adoption of green SCM practices and the challenges faced in the implementation of GSCM by public universities.

The regression model proposed was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Where; Y = operational performance of public universities

X₁ = Green purchasing

X₂ = Eco-Design and packaging

X₃ = Green Distribution

X₄ = Supplier Integration

e = Error term

β₀ is the constant, β₁, β₂, β₃, β₄ are the regression coefficients to be ascertained

CHAPTER FOUR

DATA ANALYSIS, FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the data analysis results, interpretations and discussion of findings mainly covering the Background information, Green Supply Chain Management Practices adoption and the regression analysis showing the relationship between GSCMP and performance.

4.2 Response Rate

This study targeted 32 accredited public universities in Kenya (CUE, 2022) and the complete data was obtained from 28 Universities which represented 87.50% of the respondents. This response rate is considered adequate as Babbie (2013) notes that a response rate exceeding 70% is appropriate and can be used to analyze, present and interpret the findings of any given study.

4.3 General Information

This was divided as per the respondent's positions in the university, length of service in the position that they held and the period which the universities have adopted Green Supply Chain Management Practices.

Table 4. 1 General Information

Position in the organization	Frequency	Percentage (%)
Supply chain managers	9	32.14
Procurement Managers	8	28.57
Supply chain officers	6	21.43
Procurement Officers	5	17.86
Length of service(years)		
0 -1	4	14.29
1 -5	6	21.43
6 -9	10	35.71
Over 10	8	28.57
Total	28	100

Source; Research Data (2022)

Table 4.1 indicates that 32.14% of the respondents were supply chain managers, 28.57% were Procurement Mangers, 21.43% were supply chain officers while the remaining 17.86% of the respondents were procurement officers. The outcome concludes that majority of the respondents, represented by 60.71% were in managerial positions and were in the right line of duty in participating in the study.

On the length of service, most respondents (35.71%) had worked for between 6 and 10 years in their current positions while 28.57% had worked for over 10 years with 21.43% having worked for 1- 5years. The remaining 14.29% had worked in the universities for less than a year. Thus 64.28% of the respondents had served for more than six years which is an indication that the respondents had enough experience to participate in the subject under study

4.3.2 Period of Adoption

The respondents were asked to answer for how long their universities had adopted GSCM Practices and table 4.2 presents their response.

Table 4. 2 Period of Adoption

Period of adoption (years)	Frequency	Percentage (%)
1 -5	6	21.43
6 – 10	17	60.71
Above 10	5	17.86
Total	28	100

Source; Research Data (2022)

Table 4.2 indicates that 21.43% of the universities had adopted GSCM practices for less than five years, 60.71 percent for a period between six to ten years and the remaining 17.86% had adopted the green practices for a period exceeding ten years. This is an indication that most of the universities (78.57%) have been practicing Green supply chain management for a period exceeding six years. This is a substantial duration implying that the universities had adopted the practices for a good duration to be able to draw inference on how performance is impacted by the practices.

4.4 Extent of Green Supply Chain Management Practices Adoption

The study sought to determine the extent which the Public Universities in Kenya had adopted the GSCM Practices. The rating was done using a Likert scale where 1 was to a very small extent with 5 being to a very large extent. The subsequent sub sections present the GSCMP which were further subdivided into four practices of Green Purchasing, Eco-design and Packaging Green Distribution and Supplier Integration.

4.4.1 Green Purchasing

The respondents were asked to rate the adoption of Green Purchasing on a scale of one to five and table 4.3 gives the outcome.

Table 4. 3 Green Purchasing

Statement	Mean	Std. Deviation
Purchasing of products that has little effect on the environment	3.8214	.54796
Purchasing from suppliers who are committed to green initiative policies	3.8571	1.00791
The procurement process (IFMIS) has little effect on the environment	4.1429	.70523
Formulation of policies and clauses that promote green purchasing and procurement	3.8929	.62889
Overall Score	3.9286	0.7225

Source: Research Data (2022)

Table 4.3 indicates that Purchasing of products with little effect on the environment was adopted to a large extent (M= 3.82, SD= 0.54) with purchasing from suppliers who are committed to green initiative policies (M= 3.85, SD= 1.00) also being adopted to a large extent as indicated by their respective mean and standard deviations. Also adopted to a large extent were the adoption of procurement process (IFMIS) with little effect on the environment (M= 4.14, SD= 0.70) and formulation of policies and clauses that promote green purchasing (M= 3.89, SD= 0.62)

4.4.2 Eco-Design and Packaging

The mean and the standard deviation for Eco-design and Packaging were calculated and are shown in table 4.4.

Table 4.4 illustrates that the firm only receiving products that its packaging material has minimal effect on the environment was adopted to a large extent with the mean on 3.78 and S.D of 0.68 with ensuring that the products are well labelled for proper use being adopted to a medium extent with the mean of 3.29 and S.D of 0.85. Coordinating with suppliers to have a standardized package (M= 3.35, SD= 0.98) and encouraging suppliers to adopt methods of packaging that incorporates return and reuse which promotes returned packaging (M= 3.39, SD= 0.83) were adopted to a medium extent as evidenced by their individual means and deviations

Table 4. 4 Eco-Design and Packaging

Statement	Mean	Std. Deviation
The firm only receive products that its packaging material has minimal effect on the environment	3.7857	.68622
Ensuring the products are well labelled for proper use	3.2857	.85449
Coordinating with suppliers to have a standardized package	3.3571	.98936
Encouragement of suppliers to adopt methods of packaging that incorporates return and reuse and also help in promotion of returned packaging	3.3929	.83174
Overall Score	3.4553	.84045

Source: Research Data (2022)

4.4.3 Green Distribution

The mean and the standard deviation for Green Distribution are shown in table 4.5 below.

Table 4. 5 Green Distribution

Statements	Mean	Std. Deviation
Distribution channels have little effect on the environment	3.9286	.66269
Adopt reverse logistics to minimize movement and pollution	3.3929	.56695
Routing and transport scheduling even for suppliers	3.5000	.92296
Proper disposal channels are in place	3.6429	.98936
Overall score	3.6161	.78549

Source: Research Data (2022)

From table 4.5, Distribution channels with minimal effect on the environment had a mean of 3.92 and SD of 0.66 implying that the practice was adopted to a large extent. Adopting reverse logistics to minimize movement and pollution (3.39, SD= 0.56) and routing and arranging transport scheduling even for suppliers (M=3.50, SD=0.56) were adopted to a large medium and large extent as portrayed by their respective means and deviations. Having in place proper disposal channels was adopted to a large extent with the mean of 3.64 and SD of 0.98.

4.4.4 Supplier Integration

The respondents were asked to rate (on a scale of one to five) how their respective have adopted Supplier Integration and the mean and the standard deviation of the practices are shown in table 4.6

Table 4. 6 Supplier Integration

Statement	Mean	Std. Deviation
Formation of strategic alliances with suppliers	3.9286	.76636
Engagement of suppliers in the development and design process	3.9146	.60422
Maintaining a database of strategic suppliers	4.0000	.81650
Conducting trainings and seminars to educate suppliers on the need of green and encourage them in supplying green products	4.2857	.53452
Overall score	4.0322	.68040

Source: Research Data (2022)

Table 4.6 indicates that formation of strategic alliances with suppliers was adopted to a large extent with the mean of 3.92 and deviation of 0.76. Engagement of suppliers in the development and design process (M= 3.91, SD= 0.60) and maintaining a database of strategic suppliers (M= 4.00, SD= 0.81) were adopted to a large extent as per their means and standard deviations. Conducting trainings and seminars to educate suppliers on the need of green and encourage them in supplying green products was adopted to a large extent with the mean of 4.28 and S.D of 0.53.

4.4.5 Ranking of the extent of Green Supply Chain Management Practices adoption

The extent to which Green Supply Chain Management Practices was adopted by Public Universities in Kenya were ranked from the highest to the lowest based on the rate of which each of them was being practiced and the outcome is presented in table 4.7

Table 4. 7 Ranking of extent of GSCM Practices adoption

Green Supply Chain Management Practices	Mean	Std. Deviation	Ranking
Supplier Integration	4.0322	.68040	1
Green Purchasing	3.9286	.72250	2
Green Distribution	3.6161	.78549	3
Eco Design and Packaging	3.4553	.84045	4

Source: Research Data (2022)

Table 4.7 shows the ranking of Green Supply chain management practices and Supplier integration is ranked first with the mean of 4.0322 and deviation of 0.6804. This indicates that supplier integration was adopted to a large extent by the public universities in Kenya. The outcome coincides with that of Khan et al., (2022) who noted that supplier integration require entities to operate in collaboration with their supplying entities and customers to improve stability in the environment. Ahmad, (2020) add that building strategic relationships with suppliers, distributors and customers and integrating green supply chain initiatives into any undertaking will lead to better performance in operations and sustainability. Kong et al., (2021) opine that the effective incorporation of all the supply chain players lead to the realization of a considerable competitive edge resulting to cost reduction, enhanced quality of service provided, flexibility and customer responsiveness which will enhance operational excellence. Bhatia and Gangwani, (2021) conclude that supplier integration aids in ensuring that there is trust between them and the suppliers which will make them have a shared thinking regarding green and sustainable issues and being able to build one another thus improving the overall performance.

Secondly ranked was Green Purchasing with the mean of 3.92 and deviation of 0.72. Green purchasing was adopted to a large extent as well by the public universities in Kenya. The

outcome is supported with the literature as Huma et al., (2022) established that Green procurement influences the production of quality products. Panpatil and Kant (2022) add that the entities adopt eco packaging in a drive to improve organizational efficiency, eliminate supply chain bottlenecks, reduce waste, and gain a competitive advantage. Foo et al., (2019) note that green purchasing strategies are being developed with an emphasis on how environmental considerations can be integrated into the purchase process.

Thirdly ranked, with the mean of 3.61 and S.D OF 0.78, was Green Distribution. This indicates that the public universities in Kenya have adopted green distribution to a large extent. The outcome concurs with that of Rane et al., (2020) who established that green distribution is vital in reducing CO2 emissions, developing products that are friendly towards the environment,

and well designed and reduced packaging. Han and Huo (2020) posits that Green Distribution aids in the fulfillment of demand at the right place and time, put into consideration social and ecological aspects and not only economical, ensure complete life cycle of products are sustainable, factor in the reverse logistics aspect, monitoring and improving socio-ecological effects of distribution processes in order to adopt better technology developments.

Lastly ranked is Eco Design and Packaging which had a general mean of 3.45 and S.D of 0.84. This is an indication that the public universities in Kenya adopted Eco Design and Packaging to a medium extent. The outcome contradicts that of Jassim et al., (2022) who noted that eco-design provides sustainable solution to production that reduces negative sustainability and positively impacts the economic, environmental, ethical, and social perspectives of a product or service. Varsei, 2021) further posits that there is need to collaborate with suppliers in order to have a standardized packaging, encourage the vendors to adopt methods of packaging that incorporates return and reuse and also help in promotion of returned packaging. Bhatia & Gangwani (2021) conclude that labeling of a product plays an important role in ensuring that there is proper communication on how to use the product by its destined users.

4.5 Relationship between Green supply chain management and operational performance.

The research sought to examine the relationship between GSCM and operational performance of public universities in Kenya. A linear regression was fitted to the data and the outcome is as displayed below. The regression model summary of the study is shown in table 4.8.

Table 4. 8 Regression Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.877 ^a	.770	.730	.28492

a. Predictors: (Constant), green purchasing, e-design, green distribution, supplier integration
Source; Research Data (2022)

As shown in table 4.8, the R Square is 0.77 which translates to 77%. This implies that 77% of the variations in operational performance of public universities in Kenya was explained by the variations in the independent variables (green purchasing, eco design and packaging, green distribution and supplier integration) in the model. This is a good fit as only 23% of the variance in operational performance not accounted for. Analysis of Variance is displayed in table 4.9

Table 4. 9 ANOVA Analysis

	Model	Sum of Squares	df	Mean Square	F	Sig.
	Regression	6.240	4	1.560	19.217	.000 ^b
1	Residual	1.867	23	.081		
	Total	8.107	27			

a. Dependent Variable: Operational Performance
b. Predictors: (Constant), green purchasing, e-design, green distribution, supplier integration
Source: Research data (2022)

At 5% level of significance, Table 4.9 indicates that the calculated value of F is 19.217 while F critical is 1.560 and a P value of 0% which is less than 5% hence the model is statistically significant thereby a suitable for prediction of operational performance. The P value is less than 5% (0.000 < 0.05) implying that GSCM Practices have a statistically significant relationship with Operational Performance public universities in Kenya.. The outcome concurs with that of Mojumder & Singh, 2021 who established that GSCM is an important factor in public

universities as such organizations require huge amounts of resources both tangible and intangible to achieve their operational capabilities. Table 4.0 presents the regression coefficients.

Table 4. 10 Coefficients Analysis

Model	Coefficients ^a					
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
	(Constant)	2.428	1.116		2.176	.009
1	Green Purchasing	.235	.112	.370	2.097	.007
	E-design and packaging	.308	.149	.375	2.066	.000
	Green Distribution	.427	.172	.410	2.485	.002
	Supplier Integration	.033	.123	.043	.271	.008

a. Dependent Variable: Operational Performance

Source: Research Data (2022)

The established linear regression equation becomes:

$$Y = 2.428 + .235X_1 + .308X_2 + .427X_3 + .033X_4$$

Where

Y = operational performance

X₁= Green Purchasing

X₂= Eco Design and Packaging

X₃= Green Distribution

X₄= Supplier Integration

From table 4.10, Green Supply Chain Management Practices (Green purchasing (t=2.097, P<0.05), Eco design and Packaging (t=2.066, P<0.05), Green distribution (t=2.485, P<0.05) and Supplier Integration (t=0.271, P<0.05) all have a positive and significant relationship with operational performance. The model shows that when all variables are held at constant, the value of operational performance would be 2.428.

From the above outcome, Green Supply Chain Management Practices were found to have statistically significant relationships with operational performance. The findings are consistent with that of Khan, Idrees, Rauf, Sami, Ansari and Jamil (2022) who ascertained that GSCM practices have a positive effect on technological innovation and operational performance. Jassim

et al., (2022) established that the green supply chain management provides competitive advantage in terms of cost, quality, reliability and innovation. Bor (2021) noted that Green SCM Practices influences performance of the sector of Food and Beverage Sector. Nderitu (2021) established that there was a correlation between performance and GSCMP in the solar energy firms in Kenya. Kong et al., (2021) concludes that to achieve competitive advantage and better organizational performance while taking care of all stakeholders in a public university, GSCM must be incorporated into the processes.

4.6 Challenges of implementing green supply chain management

The third objective was to determine the challenges faced in the implementing green supply chain management and the results are presented in table 4.11

Table 4. 11 Challenges of green supply chain management implementation

Statement	Mean	Std. Deviation
High costs related to the implementation of GSC management practices.	3.8261	.56977
Lacking clear statutory regulations on implementation of GSCM practices	3.6263	.97307
Lack of Resources for investing in human capital and new technologies to implement GSCM practices	4.1522	.81561
Insufficient skilled Labour	3.8043	.61894
Top management insubordination.	3.8913	.60473

Source: Research Data (2022)

Table 4.11 indicates that the challenges faced in the implementation of green supply chain management are high costs involved (M=3.82, SD=0.56), lacking clear statutory regulations (M=3.62, SD=0.97) and lack of resources for investing in human capital and new technologies to implement GSCM practices (M=4.15, SD=0.81) which were established to impede the implementation of GSCM to a large extent. Insufficient skilled Labour (M=3.80, SD=0.61) and top management insubordination (M=3.89, SD=0.60) were also established, to a large extent, as challenges faced in implementing GSCM practices.

The outcome is consistent with the literature as based on Huma et al., 2022; Panpatil & Kant, 202 and Jassim et al., 2022 who established that among the challenges faced in the implementation of GSCM entails minimum management support, high initial investment costs presence of other techniques, limited software tools that enable optimizing end to end supply chains and limited information on best practices or GSCM. Rane et al., (2020) categorizes challenges under external barriers that are made up of poor commitment from suppliers and internal barriers include no legitimacy and cost incurred. Ngigi and Busolo (2019) conclude that the government is also not doing enough to fund the Public universities and enable them fully engage in GSCM. There are also lack of stringent measures and availability of cheap alternatives as some of the GSCM implementation challenges faced by the Public universities (Ambrose, 2017).

CHAPTER FIVE:

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summaries of the study findings as per the study objectives, conclusions based on those findings, recommendations and limitations which are based on both the study findings and other relevant literature considered necessary and vital to be used in future to improve the study situation.

5.2 Summary of the Study

The study sought to investigate the influence of Green supply chain management practices on operational performance of Public Universities in Kenya. The main objectives of the paper were to establish the extent of Green supply chain management adoption, to establish the relationship between Green supply chain management practices and operational performance and to ascertain the challenges faced in the implementation of Green supply chain management practices by the Public Universities in Kenya. The theories used in the study were resource based stakeholder and systems theory. The methodology used was descriptive research design and the population of the study was 32 accredited public universities in Kenya thus census was adopted. Objective one and three of the study was analyzed using descriptive statistics while objective two was analyzed using regression analysis.

On objective one, it was noted that Public universities in Kenya have adopted Green purchasing to a large extent through the purchase of products with little effect on the environment as well as purchasing from suppliers who are committed to green initiative policies. They also adopt procurement process (electronic procurement) with little effect on the environment and forming policies and clauses that promote green purchasing. Eco design and packaging was adopted to a medium extent by only receiving products that it's packaging material has minimal effect on the environment as well as ensuring that the products are well labelled for proper use the public universities also corporates with suppliers to have a standardized package and encourages suppliers to adopt methods of packaging that incorporates return and reuse which promotes returned packaging.

Green distribution was adopted to a large extent by the public universities adopting distribution channels with minimal effect on the environment, adopting reverse logistics to minimize movement and pollution, routing and arranging transport scheduling even for suppliers and having in place proper disposal channels. Supplier integration was adopted to a large extent through the formation of strategic alliances with suppliers, engaging suppliers in the development and design process, maintaining a database of strategic suppliers and conducting trainings and seminars to educate suppliers on the need of green and encourage them in supplying green products. Green purchasing, green distribution and supplier integration were adopted to a large extent with eco design and packaging being adopted to a medium extent by the public universities in Kenya

On the second objective, it was established that Green supply chain management practices had a significant and substantial relationship with operational performance of the Public Universities in Kenya as evidenced by the P values of less than 0.05. Specifically, green purchasing, eco design and packaging, green distribution and supplier integration was found to influence operational performance through quality, dependability and cost. The third objective was achieved as it was noted that among the key challenges include high costs involved, lacking clear statutory regulations, lack of resources for investing in human capital and new technologies to implement GSCM practices, insufficient skilled Labour and top management insubordination.

5.3 Conclusions

The findings from this study clearly indicate that Green supply chain management practices significantly and positively influence operational performance of the Public Universities in Kenya. For public Universities to minimize cost, be dependable and have superior quality, they need to adopt green supply chain management practices. This is because the study has established that GSCM Practices influences the operational performance of Public Universities in Kenya. The enhanced performance has been realized through minimal production, labour and material costs, enhanced quality products, minimal defects, reliable delivery schedules, consistent products and minimized complaints from clients. Further, it can be concluded that firms that adopt green purchasing, eco design and packaging, green distribution and supplier integration are likely to achieve operational performance through minimized cost, superior quality and reliable products.

5.4 Recommendations

The findings established that most of the green supply chain management practices were adopted to a large extent by the Public Universities in Kenya. The study recommends that the Public Universities in Kenya should fully adopt green supply chain management practices as it has been established that it has a positive correlation with Operational Performance.

The study recommends that all public universities in Kenya should adopt green procurement, eco design and packaging, green distribution and supplier integration in their processes for them to minimize production and labor costs and enjoy superior quality. This is due to the fact that it has been established that the adoption of green supply chain management practices influences Cost, quality and reliability to a large extent. Therefore, firms who embrace green supply chain management practices are bound to enjoy these benefits.

There is also a need to create awareness on green supply chain management practices as a whole in the public universities and thus the study recommends that the government and stakeholders involved should create awareness on the relevance of green supply chain management practices to the public universities. Specifically, the study recommends more adoption of eco design and packaging as the literature has established that there are a lot of benefits associated with the practice yet it was adopted to a medium extent.

5.5 Suggestions for Further Research

Future studies should explore why some practices are implemented to a large extent and why others are implemented to a medium extent. Other green supply chain management practices which are not covered in this study should also be investigated to establish the reason as to why they are not being adopted.

Another study should be carried out to establish how green supply chain management practices influences organizational or supply chain Responsiveness, Procurement Performance or even how the practices gives an entity a competitive edge over their competitors.

Future studies should also focus on green supply chain management practices in other sectors (retailing, third party logistics, and service industry) apart from public universities in Kenya.

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APPENDICES

APPENDIX 1: INTRODUCTORY LETTER

APPENDIX II: PARTICIPANT’S QUESTIONNAIRE

This questionnaire is aimed at collecting information from all accredited public universities in Kenya. Data collected will be analyzed to determine how Green SCM practices influences operational performance. Information acquired is intended only for academic purposes, and discretion is guaranteed.

SECTION A: RESPONDENTS DEMOGRAPHICS

1. Kindly provide the identity of the University (Optional).

.....
.....

2. Kindly indicate your role in the entity?

- a) Supply chain manager []
- b) Supply Chain manager Officer []
- c) Procurement Manager []
- d) Procurement officer []

3. What is the period (Years) of your working at the University?

- a) Below 1 []
- b) 1 -5 []
- c) 6-9 []
- d) Above 10 []

4. For what period (Years) has this entity adopted green supply chain management practices?

- a) Less than 1 ()
- b) 1– 3 ()
- c) Above 3 ()

SECTION B: GREEN SUPPLY CHAIN MANAGEMENT ADOPTION

5. To what extent have the subsequent GSCM practices been adopted in the University? Kindly indicate on a scale 1 to 5: (where: 1- very small extent, 2- small extent, 3- medium extent, 4- large extent and 5- very large extent)

Green Purchasing	1	2	3	4	5
Purchasing of products that has little effect on the environment					
Purchasing from suppliers who are committed to green initiative policies					
The procurement process (IFMIS) has little effect on the environment					
Formulation of policies and clauses that promote green purchasing and procurement					
Eco-design and Packaging					
The firm only receive products that its packaging material has minimal effect on the environment					
Ensuring the products are well labelled for proper use					
Coordinating with suppliers to have a standardized package					
Encouragement of suppliers to adopt methods of packaging that incorporates return and reuse and also help in promotion of returned packaging					
Green Distribution	1	2	3	4	5
Distribution channels have little effect on the environment					
Adopt reverse logistics to minimize movement and pollution					
Routing and transport scheduling even for suppliers					
Proper disposal channels are in place					
Supplier integration	1	2	3	4	5
Formation of strategic alliances with suppliers					
Engagement of suppliers in the development and design process					
Maintaining a database of strategic suppliers					
Conducting trainings and seminars to educate suppliers on the need of green and encourage them in supplying green products					

SECTION C: OPERATIONAL PERFORMANCE STATEMENT

7. To what extent has implementing GSCM practices influenced operational performance measures indicated below?

Measures of performance	Rating scale between 1-5				
	1	2	3	4	5
COST					
Low production cost					
Minimized labour cost					
Reduced material cost					
QUALITY					
Enhanced quality products					
Conformance to specifications					
Reduced defects					
RELIABILITY					
Reliable delivery schedule					
Reliable and consistent products					
Minimized complaints from clients					

SECTION D: BARRIERS OF GREEN SUPPLY CHAIN MANAGEMENT PRACTICES IMPLEMENTATION

8. Kindly rate the level of agreement with the listed challenges of implementing Green SCM practices.

Challenges	1	2	3	4	5
High costs associated with implementing of GSC management practices.					
Absence of clear government regulations on implementation of GSCM practices.					
Lack of Resources for investing in human capital and new technologies to implement GSCM practices.					
Inadequate skilled Personnel					
Lack of top management support.					

Any other challenges kindly indicate

.....

Thank you for your cooperation

APPENDIX III: LIST OF PUBLIC UNIVERSITIES IN KENYA

1. Alupe University College (MU)	16. Machakos University
2. Garissa University College (MU)	17. Maseno University (Maseno)
3. Chuka University	18. Masinde Muliro University of Science and Technology (MMUST)
4. Dedan Kimathi University of Technology	19. Meru University of Science and Technology
5. Egerton University	20. Moi University (MU)
6. University of Embu	21. Multimedia University of Kenya
7. Jaramogi Oginga Odinga University of Science and Technology	22. Murang'a University of Technology
8. Jomo Kenyatta University of Agriculture and Technology (JKUAT)	23. Pwani University
9. Karatina University	24. Rongo University
10. Kenyatta University	25. South Eastern Kenya University
11. Kibabii University	26. Taita Taveta University
12. Kirinyaga University	27. Technical University of Kenya
13. Kisii University	28. Technical University of Mombasa
14. Laikipia University	29. The Co-operative University of Kenya
15. Maasai Mara University	30. University of Eldoret
	31. University of Kabianga
	32. University of Nairobi (UoN)

Source; *Commission for University Education (2022)*