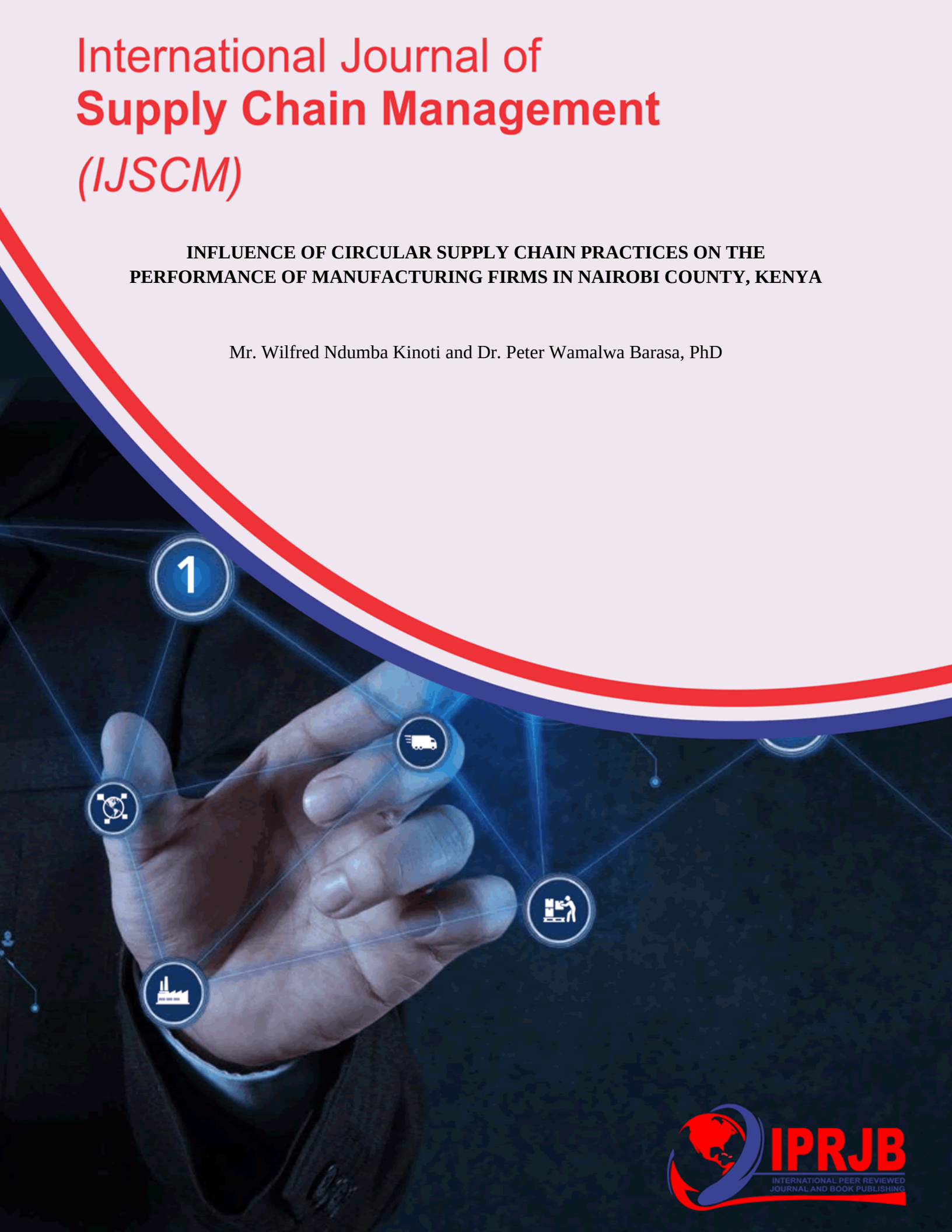
International Journal of
Supply Chain Management
(IJSCM)

INFLUENCE OF CIRCULAR SUPPLY CHAIN PRACTICES ON THE PERFORMANCE OF MANUFACTURING FIRMS IN NAIROBI COUNTY, KENYA

Mr. Wilfred Ndumba Kinoti and Dr. Peter Wamalwa Barasa, PhD



IPRJB
INTERNATIONAL PEER REVIEWED JOURNAL AND BOOK PUBLISHING

International Journal of Supply Chain Management

ISSN 2518-4709 (Online)

Vol.7, Issue 2, No.3, pp 34-59, 2022

www.iprjb.org

Influence of Circular Supply Chain Practices on the Performance of Manufacturing Firms in Nairobi County, Kenya

Mr. Wilfred Ndumba Kinoti*,

*School of Business and Economics, Mount Kenya University-Thika

P.O BOX 42702- 80100, Mombasa Kenya

Corresponding Author's Email: kinotiw@gmail.com

Dr. Peter Wamalwa Barasa, PhD**

**School of Business and Economics, Mount Kenya University-Thika

P.O BOX 42702- 80100, Mombasa Kenya

Co-Author's Email: bwamalwa@mku.ac.ke or petbar2001us@yahoo.com

Article History

Received 15st October 2022
Received in Revised Form 25th October 2022
Accepted 8th November 2022

Abstract

Purpose: Previous studies conducted in Kenya and elsewhere in the world have investigated how circular economies affect various aspects of the firm's performance such as supply chain performance, distribution, customer service among others. The goal of this study was to investigate the influence of Circular Supply Chain Practices (CSCP) on the performance of the Manufacturing Firms in Nairobi County, Kenya.

Methodology: The study adopted a descriptive Research design. The target population of this research was the eight hundred employees working in the160 manufacturing firms in Nairobi County, Kenya. It employed a stratified sampling method whereby a sample of 100 respondents were selected, and used questionnaires to collect data. It adopted descriptive and inferential statistics to evaluate the variables numerically whereby Statistical Package for Social Students (SPSS) was used in the data analysis. In determining the relationship between Circular Supply Chain Practices and the performance of manufacturing firms in Nairobi County, Kenya, the regression model was used. The data and results of the study were presented in tables.

Findings: Findings showed that circular supply chain practices have positive and significant influence on performance of manufacturing firms in Nairobi County. The regression analysis reveals that 89.2% Variations in the performance of manufacturing firms in Nairobi County are as a result of circular supply chain practices with (R^2=0.892)

Unique Contribution to Theory, Practice and Policy: The study recommends that manufacturing firms should put in place mechanism to improve reverse logistics, green policy regulation, sustainable supply chain collaboration and product design practices. Further, the government should formulate adequate policies that would provide a good framework to make use of circular supply chain practices.

Keywords: *Circular Supply Chain Practices, Performance of the Manufacturing Firms, Nairobi County*

International Journal of Supply Chain Management

ISSN 2518-4709 (Online)

Vol.7, Issue 2, No.3, pp 34-59, 2022

www.iprjb.org

INTRODUCTION

In the current marketplace, competition between organizations both locally and globally is greater between their supply chains than within the firms themselves. For this reason, Supply Chain Management and the practices carried out by an organization have become critical success factors for any such firm to sustain leadership in the marketplace. An insight into supply chain management is now imperative for a firm to remain competitive in the global market and to improve profitability, (Omar & Nairobi, 2020)The success of many organizations is therefore remaining largely determined by the efficiency in which their supply chains are managed, and the kind and nature of supply chain practices that they implement.

A circular supply chain is a supply chain that is geared towards reusing its ostensible waste materials returns. It aims at taking these waste materials and returning them and converting them into new products that can be resold. The circular supply chain (CSC) is a model that encourages manufacturers and sellers of products to take discarded materials and remake them for resale. The older model of taking, making, and disposing of is an economic dead-end that is costing businesses as they struggle with raw material costs and volatility. Instead of producing products for one-time use, companies are melting down used parts products to turn back into their raw material form. The target is establishing a framework and chances for economic growth that minimize negative environmental impacts by enhancing the value and quality of materials, components, and products, or by reusing them several times (Bocken et al., 2018)The primary theme of a circular supply chain, according to (Bocken et al., 2018)is to grow economic performance with minimal inputs and little environmental impact. When the world's resources are depleted as a result of economic growth, it’s time to think of fresh methods to put them to use, according to circular supply chain approaches. Circular delivery, waste re-use, longer-term storage, and industry al symbiosis are just a few examples (Kirchherr et al., 2017)Circular suppliers highlight the delivery of 100% recyclable and renewable resources. Businesses should focus on reducing waste and inefficiency to make better use of limited resources (Barr & Accenture, 2014)

Circular supply chain methods are based on the assumption that when the world's resources are depleted as a result of economic growth, it’s time to think of fresh methods to put them to use. Circular delivery, waste re-use, longer-term storage, and industrial symbiosis are just a few examples (Kirchherr et al., 2017)The delivery of totally recyclable and renewable resources is emphasized in circular supplies. The emphasis is on businesses minimizing waste and inefficiency to make better use of limited resources (Barr & Accenture, 2014)

China was the first country that adopted CSCP in its governmental policies since 2012. Targeting a successful and effective implementation of CSCP, the Chinese government implemented it horizontally within industries, urban infrastructure, cultural, environmental, and social consumption systems, and vertically on the micro-level (enterprises), and macro-level (cities and regions). China's transformation strategy toward CSCP was through the "Twelfth five-year plan for national Economy and Society Development" that aims to promote green development and circular economy in China. It targeted to extend resource productivity by 15% over the five years.

The European Union (EU) adopted CSCP in 2015 as a part of the EU's 2020 strategy initiative to shift the European economy towards a more sustainable direction. In this context, the EU policies included legislative proposals on waste, with long-run targets to reduce landfilling and increase recycling and reuse. It also included an action plan to support the circular supply chain practices in each step of the value chain from production to consumption, repairing and remanufacturing, and waste management (Chome et al., 2020)The Netherlands also adopted CSCP within its governmental program aimed to full adoption by 2050. The government selected five economic sectors and value chains to switch to a circular supply chain which includes: Biomass and food; Plastics; the Manufacturing industry; the Construction sector; and Consumer goods. (Barra, Ricardo and Leonard, 2018)

Globally, the Covid pandemic has truly been a wild ride for the manufacturing business. It started out as a factor disrupting supply chains due to the lockdown in China and quickly turned into the largest downturn in production ever seen. Year-to-year declines were slightly larger than those seen in the 2008 Global Financial Crisis, which was mainly because, in the end, China experienced only a relatively moderate decline in activity. The decline was the largest in the Eurozone and in Emerging Asia outside of China where declines in production were about -30% year to year during the first lockdown wave. In the Eurozone, industrial production dropped by -28.7%, ranging from -6.9% in Finland to - 43.7% in Italy according to the Global Industry outlook, 2021.

In Africa, the population is growing at a relatively high rate, putting accelerating pressure on its natural resources, and therefore the risks of recent environmental issues such as climate change and its impacts become a real threat to African countries since the majority African population still heavily depend on natural resources and traditional agricultural sector in their living. These factors make CSCP are a reasonable strategy that could help African countries to achieve sustainable development with efficient use of their natural resources. Although the circular economy model remains relatively new, some countries already prefer to include it in their strategies to scale back the environmental deterioration and achieve sustainability.

The circular supply chain concept is relatively new in Kenya although, the government, through the Ministry of Environment and Forestry (MoEF), Trade and Industrialization, and in conjunction with multilateral agencies, is supporting its achievement by developing regulatory frameworks that ensure a smooth transition from a linear economy. Through collaborative Public-Private partnerships, Kenya is on a path to strategically integrating circularity in key sectors that will result in the development of new businesses active in redesigning, recycling, and waste management. Companies ought to get ready for a circular economy approach and look at all aspects of their business and value chain following the circular Rethink, Redesign, Reduce, Reuse, Repair, Refurbish, Remanufacture and Recycle thinking approach.

Kenya Vision 2030 is the country’s blueprint for development covering the period 2008 to 2030. It aims at transforming Kenya into an industrialized middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. Under the social pillar, waste management has been highlighted as a key factor to be addressed urgently. In the Kenyan

manufacturing sector, raw material prices are always a never-ending struggle for many companies trying to plan their budgets and keep the total costs of goods under control. Several classes of virgin materials are ever-shifting in price, especially metals which have seen more volatility recently than any decade in the 20th century. By projecting the amount of reused and recycled materials to be used in the production of new goods, companies can more accurately gauge their expenditures and keep costs at a minimum. As consumers keep generating more and more waste each year, it's up to both corporate and individual consumers to choose products that have minimal environmental footprints.

The manufacturing sector is a key player in the economy and the changes in consumer tastes and preferences, technology and regulation have to be very agile and respond to such changes to remain profitable. One way in which this sector is adapting to these changes is through the adoption of Circular Supply Chains. Firm performance is measured using a myriad of metrics which include cost savings, quality improvement, reduced led times, reduced customer returns, and other financial metrics such as return on investment. All these performance measures will be influenced one way or the other by circular supply chain activities practiced by a firm. Circular supply chain practices under consideration in this study will be reverse logistics, green policy and regulation, product design, and sustainable supply chain collaboration. The question is how these are related to firm performance. This relationship is what the study seeks to establish.

Several worldwide and international research on circular supply chain practices have been carried out. (Botezat et al., 2018) investigated how circular supply chain activities affect Romanian manufacturers' performance. (Afum Ebenezer & Zhuo, 2019) looked at the influence of reverse logistics on Bottled water manufacturing firms in Ghana on environmental performance and competitiveness. (Rahman et. al, 2016) looked at how businesses manage trash and how that affects their growth. The findings revealed that there is a strong link between several aspects of green and lean techniques. (Kaihan & Ai Chin, 2021) investigated the link between reverse logistics and long-term sustainability. The report presented a thorough examination that aided in the evaluation of reverse logistics performance utilizing the triple bottom line model. (Ochiri et al., 2015) investigated the strategy's impact on company performance when it comes to waste reduction. Empirical studies verified that the publishing industry's revenues and wastes were both high and that implementing waste reduction would genuinely increase the publishing firms' performance.

Most of these studies highlighted in this study were conducted abroad such as the study by (I. P. Vlachos, 2016) on the impacts of reverse logistics strategies; (production mix and product route efficiencies) on operations performance and related profitability in the scrap and steel industry in the United States. (Sri Yogi, 2015) focused on circular economy practices affecting supply chain performance among liquefied petroleum gas agencies in India. Few studies have been done in developing and less developed countries with the closest study to this being that done by (Sri Yogi, 2015). Locally, studies conducted by Ongombe (2012), Wainaina (2014), Kiberenge (2014), and

Muttimos (2014) focused on the aspects of operational performance in Chemical Industries in Kenya

From the above, not even one of the local researchers has focused on CSCP and the performance of manufacturing firms in Kenya. This study, therefore, aims to bridge this gap by studying the influence of circular supply chain practices on the performance of manufacturing firms whereby it will look into reverse logistics, product design, green policy and regulation, and sustainable supply chain collaboration as the main CSC practices influencing firms performance.

Statement of the Problem

The Manufacturing sector in Kenya has been declining over the years coming fifth after agriculture, transport and communication, wholesale and retail, and other services. This poor performance of the sector has largely contributed to Kenya's dismal performance in export trade.

According to the Manufacturing priority Agenda (Agenda, 2022)Kenya's economy is being dominated by the service sector with a 53.56% contribution towards the GDP. The share of agricultural output in the economy has been increasing from 17.57% in 2010 to 23.055 in 2020. The manufacturing sector's GDP contribution was 11.16% in 2020 but declined to 7.61 % in 2020.

Manufacturing Agenda (Agenda, 2022)) Has been erratic. Lowest manufacturing growth rates registered in 2012 and 2020 at 0.6%and -01% respectively. According to the (Kenya National Bureau of Statistics, 2021) the negative growth rate in 2020 was mainly due to the impact of Covid -19. Pressures to improve the performance of the sector have led to the adoption of CSC practices in the manufacturing firms especially, as a result of changing customer preferences and the need to improve social status. Despite the keen interest, we are a long way from achieving anything like circular supply chains. Taking the UK as an example, only 9% of plastics are recycled, and recycling in general has stagnated at 45% since 2017, with a large fraction of collected materials not recycled but incinerated, to the concern of environmentalists. So what's getting in the way of the circular supply chain? This study, therefore, seeks to find out the firms that have fully integrated the CSC model in their operations, the challenges they face, and the influence they have on the firm's performance.

Specific Objectives of the Study

i. To find out the influence of reverse logistics practices on the performance of the manufacturing firms in Nairobi County, Kenya
ii. To assess the influence of green policy and regulations on the performance of the manufacturing firms in Nairobi County, Kenya
iii. To find out the influence of product design practices on the performance of the manufacturing firms in Nairobi County, Kenya
iv. To find out the influence of Sustainable Supply Chain Collaboration practices on the performance of the manufacturing firms in Nairobi County, Kenya

International Journal of Supply Chain Management

ISSN 2518-4709 (Online)

Vol.7, Issue 2, No.3, pp 34-59, 2022

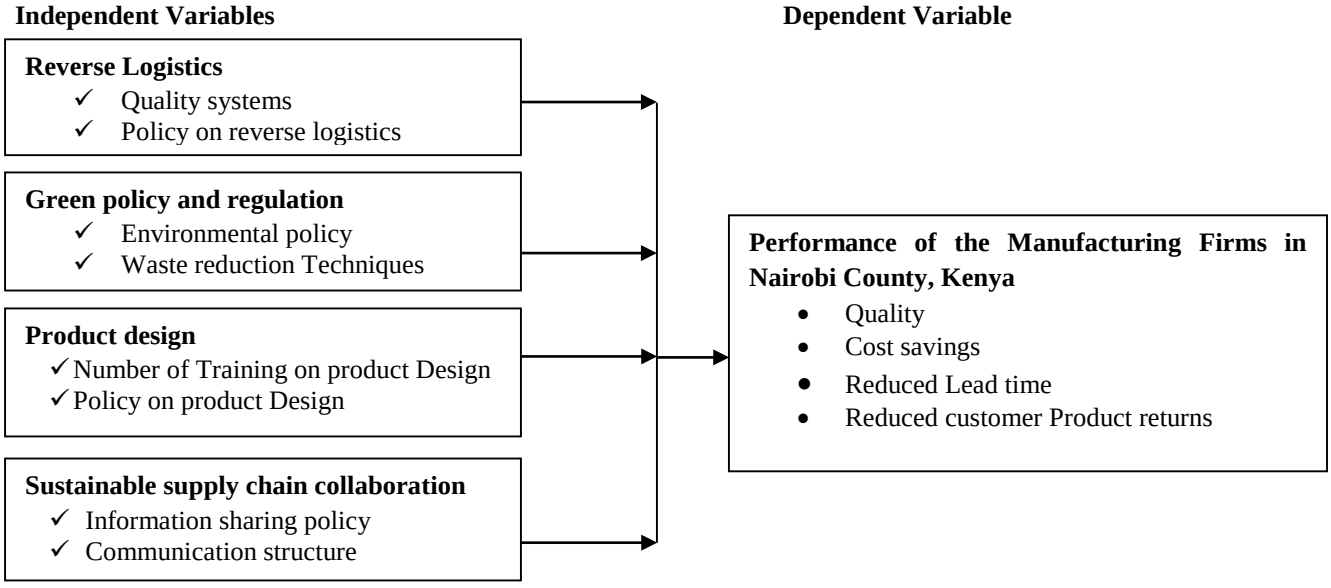
www.iprjb.org

LITERATURE REVIEW

The study reviewed the following theories; Resource-Based theory of the firm, Network Theory and Institutional Theory. The Resource-Based View Theory will guide this study since it's all about resource management. It identifies strategies that firms need to adopt in order to remain competitive as far as resource allocation is concerned. According to the RBV proposition, a firm's resources and capabilities determine how it performs and provides a sustainable competitive edge (Alvarez & Busenitz, 2017). Thus, enterprises must implement reverse logistics capabilities if they are going to achieve a reduction in costs and maximize their value (I. Vlachos, 2014). The Network theory will also guide this study significantly. The NT has made huge contributions in understanding the dynamics of inter-organizational relations and buildup of trust as a result of positive long-term relations. The strategic supplier partnerships are directly impacted by this theory.

Conceptual Frame work

The conceptual framework adopted for this study proposes that CSC practices will influence the performance of manufacturing firms. CSC practices are conceptualized in four dimensions: Reverse logistics, green policy and regulations, product design, and sustainable supply chain collaboration. The CSC practices are the independent variables while the performance of manufacturing firms is the dependent variable.



Source: Researcher (2022)

Figure 1: The Conceptual framework

International Journal of Supply Chain Management

ISSN 2518-4709 (Online)

Vol.7, Issue 2, No.3, pp 34-59, 2022

www.iprjb.org

Influence of Reverse Logistic Practice on Performance of the Manufacturing Firms in Nairobi County, Kenya

The influence of reverse logistics on the performance of manufacturing firms can be realized from different perspectives. For instance, reverse logistics has a positive influence on performance through the creation and sharing of knowledge. According to (Vlachos, 2016)reverse logistics encourages the creation and distribution of knowledge across the supply chain thus decreasing ambiguity of reverse logistics procedures. This opportunity helps the firm advance the quality of its products, reduce lead time, and improve dependability in supplying products when required.

Reverse logistics warrants cost reserves. According to (Afum Ebenezer & Zhuo, 2019)a firm would devote fewer finances on inputs through reuse and remanufacturing, The decline in waste through recycling and salvaging would guarantee a firm keeps its waste management costs at a minimum. Information sharing transverse the reverse chain would diminish information costs and advance flexibility of information distribution (Seebacher & Winkler, 2013)besides cost reductions, reverse logistics contributes to reliability and dependability. It's through the tracking of the reverse flows that returns from customers will reach the firm faster and complaints will be resolved more quickly hence increasing customers' confidence in the firm.

The element of joint ventures and third-party reverse logistics partners create a positive impact on operational performance. Third-party reverse logistics providers have more advanced information systems, material handling equipment, and sufficient warehouses (Samson, 2018)Hence, through third-party reverse logistics providers, a firm would be able to improve the speed of delivery of products to customers and enhance its flexibility by focusing on its core competencies. According to ((Seebacher & Winkler, 2013)reverse logistics reduces the uncertainty of information, therefore, improving flexibility of information distribution and dependability of processes.

Influence of Green Policy and Regulations on the Performance of the Manufacturing Firms in Nairobi County, Kenya

Greening of the global product chains forms a challenging business-to-business shortcut for creating fair trading relationships while avoiding the long and slow route of negotiations according to (Gokmen et al., 2020)An example is illustrated by the Benin cotton project on sustainable chain management where the producers organized for an organic cotton chain for the European market. The farmers claimed that the use of chemicals leads to high yields which are diminished by the cost of medicine due to sickness as opposed to the use of manure (Kessler et al., 2003)

From the TQM perspective (Mwanyota, 2021)notes that developing synergies between operational performance and environmental excellence may lead to a more globalized level of customer satisfaction, one that includes both cost competitiveness and environmentally sound products. Manyota notes that there is the general perception that green policy and regulation promotes efficiency and synergy among business partners and their lead corporations, and helps to enhance environmental performance, minimize waste and achieve cost savings.

Chandaria Industries use waste paper as raw material and the firm is ranked one of the best industrial enterprises in Kenya. Bamburi cement factory in Mombasa put up a park to counter the effects of mining on the environment, Pil manufactures biodegradable polythene bags and organic products have become a household name. East African breweries rank highly in profitability though alcohol is subjected to strict legislation to discourage consumption. In summary, the potential benefits of green policy and regulation are those that relate to cost avoidance and risk reduction. This includes the cost of avoidance of stigmatization or market resistance to environmentally harmful products and cost avoidance of public and regulatory hostility towards environmentally harmful organizations, plus reduced environmental and health risks, liability risks, and safer cleaner factories (Gellynck et al., 2008)

Influence of Product Design Practice on Performance of the Manufacturing Firms in Nairobi County, Kenya

Product design, by influencing both strategy-making and the interpretation of consumers' needs, can facilitate the integration of new ideas across the organization, thus increasing efficiency and reducing time to market(D'Ippolito, 2014). More recent scholarly efforts have focused on the assessment of the extent to which design can contribute towards companies' financial performance (D'Ippolito, 2014)Generally, it can be confirmed that product design impinges on price and non-price factors such as product performance, ease of use, durability, and product delivery. This argument strengthens the point that design has the potential to bring into the picture some non-technological dimensions of new products that firms had not considered (Candi & Gemser, 2010)What's very clear in this discussion is that design influences not only products but also the set of mechanisms through which firms generate added value. Because of the strict bond between design and firm identity, likely, the role of design in shaping a firm's business model is mostly influential during the value creation phase, that is, when the user targets are identified and the product features defined (D'Ippolito, 2014)Product design also shapes consumption choices by triggering an emotional response from the consumers and, at the same time, it is inspired by their responsibility for the creation of new symbols or values (D'Ippolito, 2014).

Influence of Sustainable Supply Chain Collaboration Practice on Performance of the Manufacturing Firms in Nairobi County, Kenya

Knowledge is power and in the matter of sustainable supply chain collaboration, information sharing leads to enhanced knowledge across the chain that allows you to achieve: lower inventory levels and higher inventory turns, shorter lead times, lower stock out levels, improved customer service, and faster decision making (Ballantyne & Varey, 2006)

Transparency and collaboration might be difficult to execute, but it's worth the effort considering the potential reduction in risk and costs, and improvement in customer satisfaction and loyalty. A recent survey of roughly 1,000 supply chain executives found that organizations that engaged with suppliers like partners at any levels were 38% more likely to achieve or surpass expectations and have their initiatives resulting to cost reductions (2012 survey by Deloitte, in conjunction with ASQ, Institute for Supply Management, and Corporate Responsibility Officer Association)

Businesses today have understood the value of customer retention, as well as the level of competition vying for brand loyalty. However, when you can offer your suppliers and partners a unified platform to collaborate on matters such as complex market regulations, as well as transparent ethical standards, you will be demonstrating to your clients, your business's professionalism and dedication to efficiency, proving that cooperation with your brand is an opportunity for your SC partners to raise their profile and generate more business (Kirchherr et al., 2017)

Delivering high-quality products which are safe is key to customer satisfaction and therefore, it is something that every brand and retailer aspires to achieve. Collaborating with a key supply chain partner presents you with an extra perspective on the challenges facing product quality and safety in your industry. It also gives you an opportunity to work together towards the achievement of greater supply chain transparency, promotes higher ethical and environmental standards, and exerts better leverage over parts of your supply chain that are resistant to positive change (van der Puil & van Weele, 2013)

Research Design

The research was a descriptive research which involved collecting information by administering questionnaires to respondents. Descriptive research is one whereby data is collected without any manipulations. It investigates the relationships between variables and for this study the relationship between CSC and supply chain performance of manufacturing firms in Kenya. Descriptive studies present data in a logical form thus helping to explain the characteristics of a given group in a given situation, (Shukla, 2017)A descriptive design is applied in laying more emphasis on determining the frequency with which the variables are implemented or the extent to which the variables co-vary,(Magout, 2020)

Target Population

The study targeted eight hundred employees working in the160 manufacturing firms in Nairobi County, Kenya. Nairobi was factored as the best county to conduct this study because it hosts a huge number of manufacturing companies in Kenya.

Table 1: Target Population

Sector	Population
Building and construction	40
Chemical industry	103
Energy industry	70
Agro-processing	165
Leather	20
Metals	62
Vehicles	30
Paper products	78
Pharmaceuticals	40
Plastic	88
Fabric and Wears	65
Timber	38
Total	800

Source: KAM (2022)

Sample and Sampling Procedure

A stratified sampling method was used whereby a sample of 100 respondents was selected. This method was once applied by (Mauti & Muturi, 2018)while conducting research on manufacturing firms in India. In selecting the sample, the (Cooper & Schindler, 2014) formula which was used by (Mauti & Muturi, 2018)was used for purpose of this study. This is formula requires that 10% of the target population be taken as the representative sample size. Since in the (Mauti & Muturi, 2018)study, not all chosen respondents agreed to participate in the study, an extra 2.5% was considered making the sample size 12.5% of the target population which was 100 respondents as shown in table 2.

Table 1: Sample size

Sector	Target population	Sample Size (12.5%)
Building and construction	40	5
Chemical industry	103	13
Energy industry	70	9
Agro-processing	165	21
Leather	20	3
Metals	62	8
Vehicles	30	4
Paper products	78	10
Pharmaceuticals	40	5
Plastic	88	11
Fabric and Wears	65	8
Timber	38	5
Total	**800**	**100**

Source: KAM (2022)

Data Collection Method

Data for the research was gathered through the use of questionnaires that were distributed to the respondents. A questionnaire is a type of data gathering instrument that contains a set of questions and additional requests for respondents to fill out (Magout, 2020). The questionnaires were administered by dropping and picking them up.

Validity and Reliability of Research Instrument

Validity refers to the extent to which research results can be accurately interpreted and generalized to other populations (Chen et al., 2019).The employees and the firms were randomly selected to effectively carry out the exercise. The pre-test questionnaire was used to ensure that the items in the questionnaires were stated clearly and had the same meaning to all respondents and other merits such as the clarity of the questionnaire and time taken to administer it. The researcher discussed the pre-test questionnaires with colleagues to determine their validity. The suggestions made by the panellists aided the researcher in determining the validity of instruments.

In this study, reliability was tested using the internal consistency method that is estimated using Cronbach's alpha. Reliability coefficients of 0.70 or higher are considered adequate and this is the threshold that was used by this study.

Data Analysis and Discussion

Influence of Reverse Logistics Practices on the Performance of Manufacturing Firms in Nairobi County, Kenya

From table 3, the analysis indicate that majority of respondents agree to large extent that reverse logistics has been adopted by manufacturing firms an (Overall mean = 4.285, SD=1.0205). The study also found that the highest adopted reverse logistics practice was resale of returned products

after repairs with a (mean = 4.41, SD= 0.891), followed by replacement of goods returns from customers with a (mean=4.31, SD= 1.114). The least reverse logistics adopted by the firms was repairs of returned goods with a (mean =4.17, SD=1.058).

Table 3: Adoption of Reverse Logistics Practices

Practices	N	Mean	Standard Deviation
Firms accepts returns from customers	81	4.25	1.019
Firm repairs returned goods from customers	81	4.17	1.058
Ensures replacement of goods returned from customers	81	4.31	1.114
My firm resells returned products after repairs.	81	4.41	0.891
Overall mean value		4.285	**1.0205**

Source: Research Data (2022)

Table 4 shows the correlation between reverse logistics and performance of manufacturing firms. The analysis shows that reverse logistics has a strong positive correlation with all the performance indicators of manufacturing firms that include product value (r=0.894), cost reduction (r=0.763), lead time reduction (r=0.561) and reduced customer Product returns(r=0.882.

Table 4: Correlation Matrix

-	Reverse Logistics	Product Value	Cost Reduction	Lead time Reduction	Customer Product Returns
Reverse logistics	1				
Product value	0.894	1			
Cost reduction	0.763	0.438	1		
Lead time reduction	0.561	0.455	0.489	1	
Reduced customer Product returns	0.882	0.898	0.453	0.976	1

Source: Research Data (2022)

From the regression analysis as shown in Table 5 below, it shows there is a positive relationship between reverse logistics with the performance indicators of manufacturing firms that include lead time reduction (p=0.281); Reduced customer product returns with (p =0.598) and cost reduction (p=0.948) are not significant as $p \geq 0.05$. There is a positive relationship between reverse logistics with the performance indicators of manufacturing firms in terms of product value (p=0.045)

Table 5: Regression Coefficients

Variables	β	Std. Error	t value	P value
Constant	11.064	3.39	3.451	0.004
Product value	0.143	0.137	0.316	0.045
cost reduction	0.131	0.155	-0.066	0.948
Lead time reduction	0.186	0.166	-1.121	0.281
Reduced customer Product returns	0.068	0.125	-0.54	0.598

Source: Research Data (2022)

Influence of Green Policy and Regulation Practices on the Performance of Manufacturing Firms in Nairobi County, Kenya

From analysis as shown in Table 6, green policy and regulation practice to the large extent has been adopted in the Manufacturing firms in Nairobi County a with a (mean =4.49; SD=0.747). It shows that the most adopted green policy and regulation practice with a (mean =4.72; SD= 0.530) is use of environmentally friendly practices to ensure that emissions are minimized. This is followed by placement of measures to ensure that the manufacturing process is environmentally friendly with (mean = 4.42; SD= 0.878) and lastly was adoption of waste reduction techniques with (mean =4.32; SD= 0.834)

Table 6: Adoption of Green Policy and Regulation Practices

Practices	N	Mean	Standard Deviation
My company has put in place measures to ensure that the manufacturing process is environmental friendly.	81	4.42	0.878
The company ensures that emissions are minimized	81	4.72	0.530
The company has adopted waste reduction techniques.	81	4.32	0.834
Overall mean value		4.49	0.747

Source: Research Data (2022)

From correlation analysis as shown in Table 7, the study revealed that that green policy and regulation has a strong positive correlation with the performance indicators of manufacturing firms that include with product value with (r=0.898), cost reduction with (r=0.891), lead time reduction with (r=0.462) and reduced customer product returns with (r=0.595)

Table 7: Correlation Matrix

	Green policy and regulation	Product Value	Cost Reduction	Lead time Reduction	Customer Product Returns
Green policy regulation	**1**				
Product value	0.898	1			
Cost reduction	0.891	0.438	1		
Lead time reduction	0.462	0.455	0.489	1	
Reduced Customer Product returns	0.595	0.898	0.453	0.976	1

Source: Research Data (2022)

From regression analysis as shown in table 8, the study shows that there is a positive correlation between green policy and regulation with the performance indicators of manufacturing firms that include with product value with (p=0.455), cost reduction with (p=0.715), lead time reduction with

(p=0.639) and reduced customer product returns with (p=0.709) but was not significant as the p-values were greater than 0.05

Table 2: Regression Coefficients

Variables	β	Std. Error	t value	P value
Constant	10.009	3.47	3.552	0.005
Product value	0.264	0.344	-0.769	0.455
cost reduction	0.144	0.387	-0.373	0.715
Lead time reduction	0.199	0.416	0.479	0.639
Reduced customer returns	0.037	0.313	0.117	0.709

Source: Research Data (2022)

Sustainable Supply Chain Collaboration and Performance of Manufacturing Firms in Nairobi County, Kenya

From analysis as shown in Table 9, sustainable supply chain collaboration to a moderate extent has been adopted in the Manufacturing firms in Nairobi County a with a (mean =3.83; SD=0.1.296). The firms ensure transparency in coordination between internal and external stakeholders to a moderate extent with a (mean =3.99; SD= 1.24). It also shows that moderately throughout the firm, there is real time shared visibility and processes with supply chain partners with (mean =3.67; SD 1.351).

Table 9: Adoption of Sustainable Supply Chain Collaboration Practices

Practices	N	Mean	Standard Deviation
The company ensures transparency in coordination between internal and external stakeholders	81	3.99	1.240
Throughout the firm there is real-time shared visibility and processes with supply chain partners	81	3.67	1.351
Overall mean value		3.83	1.296

Source: Research Data (2022)

From correlation analysis as shown in Table 10, the study revealed that that sustainable supply chain collaboration has a strong positive correlation with the performance indicators of manufacturing firms that include with product value with (r=0.834), cost reduction with (r=0.839), lead time reduction with (r=0.465) and reduced customer product returns with (r=0.769)

International Journal of Supply Chain Management

ISSN 2518-4709 (Online)

Vol.7, Issue 2, No.3, pp 34-59, 2022

www.iprjb.org

Table 3: Correlation Matrix

	Sustainable supply chain collaboration	Product Value	Cost Reduction	Lead time Reduction	Reduced Customer Product Returns
Sustainable supply chain collaboration	1				
Product value	0.834	1			
Cost reduction	0.839	0.438	1		
Lead time reduction	0.465	0.455	0.489	1	
Reduced Customer product returns	0.769	0.898	0.453	0.976	1

Source: Research Data (2022)

From regression analysis as shown in table 11, the study shows sustainable supply chain collaboration has a positive and significant correlation with the performance indicators of manufacturing firms that include with product value with (p=0.014) and cost reduction with (p=0.017). However the correlation of sustainable supply chain collaboration and the performance indicators of manufacturing firms that include lead time reduction with (p=0.099) and reduced customer product returns with (p=0.204) is not significant as the p- values were greater than 0.05

Table 4: Regression Coefficients

Variables	β	Std. Error	t value	P value
Constant	10.145	3.01	3.95	0.005
Product value	0.47	0.361	1.302	0.014
cost reduction	0.587	0.406	1.444	0.017
Lead time reduction	0.113	0.437	0.259	0.099
Reduced customer returns	0.404	0.329	1.227	0.204

Source: Research Data (2022)

Influence of Product design practices and performance of manufacturing firms in Nairobi County, Kenya

From analysis as shown in Table 12, Product design practices have been adopted to a large extent in the Manufacturing firms in Nairobi County a with a (mean =4.07; SD=1.213). On a continuous basis, the company creates systems that ensure varied product designs with (mean = 3.73; SD=1.323). Firms also have put in place a team to review the product designs regularly as per market requirement shown with a (mean = 3.96; SD=1.327) while majority of respondents agree to large extent that the firms guarantee that products come in a variety of shapes and sizes to meet the needs of the end consumers as indicated with (mean = 4.51; SD=0.989).

Table 12: Adoption of Product Design Practices

Practices	N	Mean	SD
On a continuous basis, the company creates systems to ensure varied product designs.	81	3.73	1.323
My company has put in place a team to review product designs regularly as per market requirement.	81	3.96	1.327
The organization guarantees that products come in a variety of shapes and sizes to meet the needs of end consumers.	81	4.51	0.989
Overall mean value		**4.07**	**1.213**

Source: Research Data (2022)

From correlation analysis as shown in Table 13, the study revealed that that Product design practices has a strong positive correlation with the performance indicators of manufacturing firms that include with product value with (r=0.875), cost reduction with (r=0.791), lead time reduction with (r=0.542) and reduced customer product returns with (r=0.711)

Table 5: Correlation Matrix

	Product Design	Product Value	Cost Reduction	Lead time Reduction	Reduced Customer Product Returns
Product Design	1				
Product value	0.875	1			
Cost reduction	0.791	0.438	1		
Lead time reduction	0.542	0.455	0.489	1	
Reduced Customer Product returns	0.711	0.898	0.453	0.976	1

Source: Research Data (2022)

From regression analysis as shown in table 14, the study shows Product design practices has a positive and significant correlation with the performance indicators of manufacturing firms that include with product value with (p=0.008) However the correlation of sustainable supply chain collaboration and the performance indicators of manufacturing firms that include cost reduction with (p=0. 0.407), lead time reduction with (p=0.371) and reduced customer product returns with (p=0.094) is not significant as the p- values were greater than 0.05

Table 6: Regression Coefficients

Variables	*β*	*Std. Error*	*t value*	*P value*
Constant	12.903	3.63	4.002	0.004
Product value	0.364	0.186	1.961	0.008
cost reduction	0.179	0.209	0.855	0.407
Lead time reduction	0.208	0.225	0.925	0.371
Reduced customer Product returns	0.304	0.169	1.799	0.094

Source: Research Data (2022)

Influence of Circular Supply Chain Practices on the Performance of Manufacturing Firms in Nairobi County, Kenya

A regression model as shown in table 15, established the relationship between the circular supply chain practices and their influence on performance of manufacturing firms in Nairobi County. As indicated in table 15, the regression analysis reveals that 89.2% changes in supply chain performance of manufacturing firms in Nairobi County is as a result of circular supply chain practices (R^2=0.892)

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std Error of the Estimate
1	0.945	0.892	0.882	0.11035

Predictors: (Constant), RL, PD, GRP, SSC

Source: Research Data (2022)

Influence of Circular supply chain practices on Performance of manufacturing firms in Nairobi County in terms of product value

From ANOVA analysis as shown in table 16 indicates that the F static value was 1.654 with a p value= 0.026. The p values are less than the critical value ($p \leq 0.05$) which means Circular supply chain practices influences Performance of manufacturing firms in Nairobi County in terms of product value

Table 16: ANOVA (Performance in Terms of Product Value)

	df	SS	MS	F	Sig.
Regression	1	25.876	6.469	1.654	.026
Residual	79	54.755	3.911		
Total	80	80.631			

Source: Research Data, 2022

From multiple regression analysis as shown in table 17 above, reverse logistics has a weak positive relationship with performance of manufacturing firms in Nairobi County in terms of product value. The relationship is statistically significant at 5% confidence level since p =0.045 < 0.05. Green policy and regulation has a negative relationship with this aspect of performance and the relationship is not statistically significant at 5% since p = 0.455 >0.05. Product development has a strong positive relationship with performance (p=0.071) which is statistically significant at 5%. Sustainable supply chain collaboration has a positive relationship with performance in reference to product value and the relationship is statistically significant at 5% confidence level (p=0.034).

International Journal of Supply Chain Management

ISSN 2518-4709 (Online)

Vol.7, Issue 2, No.3, pp 34-59, 2022

www.iprjb.org

Table8: Regression Coefficients (Performance in Terms of Product Value)

Model	β	Std. Error	t value	P value
Constant	11.664	3.39	3.441	0.004
Reverse logistics	0.143	0.137	0.316	0.045
Product development	0.364	0.186	1.961	0.07
Green policy and regulation	-0.264	0.344	-0.769	0.455
Sustainable supply chain collaboration	0.47	0.361	1.302	0.214

Source: Research Data (2022)

The resulting equation was as follows:

Y= 11.664 + 0.043RL + 0.364PD – 0.264GPR + 0.470 SSCC

Where Y = Performance of manufacturing firms in Nairobi County in terms of product value, RL=Reverse Logistics, PD= product development, GPR= Green policy regulation, SSC= sustainable supply chain collaboration

This concurs with findings by (Samson, 2018)who, considering supply chain practices and performance among public research institutions that there was a strong statistical relationship between reverse logistics and firm performance in logistics, lean suppliers and information Technology.

Circular Supply Chain Practices and Performance of Manufacturing Firms in Nairobi County in Terms of Cost Reduction

From ANOVA analysis as shown in table 18 indicates that that the F static value was 0.692 with a significant change of 0.609. The p values are greater than the critical value ($p \geq 0.05$) which means Circular supply chain practices do not have significant influence on Performance of manufacturing firms in Nairobi County in terms of cost reduction

Table18: ANOVA (Performance in Terms of Cost Reduction)

	df	SS	MS	F	Sig.
Regression	1	13.733	3.433	0.692	0.609
Residual	79	69.425	4.959		
Total	80	83.158			

Source: Research data (2022)

From table 19 above, reverse logistics and green policy regulation have a negative relationship with performance of manufacturing firms in Nairobi County in terms of cost reduction; however the relationships are not statistically significant since $p > 0.05$ at 0.948 and 0.715 respectively. Product design practices has a weak positive relationship and with the statistical insignificant relationship since $p = 0.407 > 0.05$, though sustainable supply chain collaboration has a strong statistical positive relationship with performance in terms of cost reduction but the relationship is still not significant at 5% statistical confidence level ($p = 0.171 > 0.05$). The coefficient of multiple

determinations (R^2 Square) is 0.165 implying that CSCM practices account for only 16.5% of variability in performance of manufacturing firms in Nairobi County in terms of cost reduction

Table9: Regression Coefficients (Performance in terms of Cost Reduction)

Variables	β	Std. Error	t value	P value
Constant	12.702	3.817	3.327	0.005
Reverse logistics	-0.01	0.155	-0.066	0.948
Product development	0.179	0.209	0.855	0.407
Green policy and regulation	-0.144	0.387	-0.373	0.715
Sustainable supply chain collaboration	0.587	0.406	1.444	0.171

Source: Research data (2022)

The resulting equation was as follows:

Y= 12.702 -.010RL + 0.0179PD – 0.144GPR + 0.587 SSCC

Where Y = Performance of manufacturing firms in Nairobi County in terms of cost reduction, RL-Reverse Logistics, LP = product design, GPL = Green policy regulation, SSCC= Sustainable Supply Chain Collaboration.

Influence of Circular supply chain practices on Performance of manufacturing firms in Nairobi County in terms of reduced lead time

From ANOVA analysis as shown in table 20 indicates that the F static value was 0.798 with a p value= 0.046. The p values are less than the critical value ($p \leq 0.05$) which means Circular supply chain practices influences Performance of manufacturing firms in Nairobi County in terms of reduced lead time

Table 10: ANOVA (Performance in Terms of Reduced Lead Time)

	df	SS	MS	F	Sig.
Regression	1	18.321	4.58	0.798	0.046
Residual	79	80.311	5.736		
Total	80	98.632			

Source: Research data (2022)

From multiple regression analysis as shown in table 21 above reverse logistics and sustainable supply chain collaboration have a positive and statistically significant relationship with Performance of manufacturing firms in Nairobi County in terms of reduced lead time (p=0.281 and p=0.371 respectively). Product design and green policy have a weak positive and insignificant relationship with Performance of manufacturing firms in Nairobi County in terms of reduced lead time with (p=0.639 and p=0.799 respectively) that were values are greater than 5%.

Table 11: Regression Coefficient (Performance in terms of Reduced Lead Time)

Variables	β	Std. Error	t value	P value
Constant	13.841	4.106	3.371	0.005
Reverse logistics	-0.186	0.166	-1.121	0.281
Product development	0.208	0.225	0.925	0.371
Green policy and regulation	0.199	0.416	0.479	0.639
Sustainable supply chain collaboration	0.113	0.437	0.259	0.799

Source: Research Data (2022)

The resulting equation was as follows:

Y= 13.841 + 0.186RL + 0.208PD + 0.199GPL + 0.113 SSCC

Where Y = Performance of manufacturing firms in Nairobi County in terms of Reduced lead Time, RL- Reverse logistics, P D= Product design, GPL = Green policy and regulation, SSCC= Sustainable supply chain collaboration.

Influence of Circular Supply Chain Practices on Performance of Manufacturing Firms in Nairobi County in Terms of Reduced Customer Product Returns

From ANOVA analysis as shown in table 22 indicates that the F static value was 2.132 with a significant change of p=0.013. The p values are less than the critical value ($p \leq 0.05$) which means Circular supply chain practices influences Performance of manufacturing firms in Nairobi County in terms of reduced customer Product returns

Table 12: ANOVA (Performance in terms of Reduced Customer Product Returns)

	df	SS	MS	F	Sig.
Regression	1	27.695	6.924	2.132	0.013
Residual	79	45.463	3.247		
Total	80	73.158			

Source: Research data (2022)

From multiple regression analysis as shown in table 23 above Product development, Green policy and regulation and sustainable supply chain collaboration have a positive and statistically significant relationship with Performance of manufacturing firms in Nairobi County in terms of reduced customer product returns (p=0.034, p=0.049 and p=0.044 respectively). Reverse logistics had a negative and insignificant relationship with Performance of manufacturing firms in Nairobi County in terms of reduced lead time with (p=0.598) that were values are greater than 5%.

Table13: Regression Coefficients (Performance in terms of Reduced Customer Product Returns)

Variables	β	Std. Error	t value	P value
Constant	10.065	3.089	3.258	0.006
Reverse logistics	-0.068	0.125	-0.54	0.598
Product development	0.304	0.169	1.799	0.034
Green policy and regulation	0.037	0.313	0.117	0.049
Sustainable supply chain collaboration	0.404	0.329	1.227	0.044

Source: Research data (2022)

The resulting equation was as follows:

Y= 10.065 – 0.068RL + 0.304PD + 0.037GPL + 0.404 SSC

Where Y = Performance of manufacturing firms in Nairobi County in terms of reduced customer Product returns., RL- Reverse logistics, P D= Product design, GPL = Green policy and regulation, SSCC= Sustainable supply chain collaboration.

These findings are similar to those by (Omar & Nairobi, 2020)who explored the impact of various supply chain management practices on supply chain performance in the electronics industry in Malaysia. They found out that reverse logistics had least impact in reduction of customer product returns while product development contributed largely to reducing customer product returns.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

On the influence of reverse logistics on the performance of manufacturing firms; Correlation analysis showed that there was a strong positive correlation with all the performance indicators of manufacturing firms that include product value (r=0.894), cost reduction (r=0.763), lead time reduction (r=0.561) and reduced customer returns(r=0.882. Descriptive analysis indicated that majority of respondents agree to large extent that reverse logistics has been adopted by manufacturing firms an (Overall mean = 4.285, SD=1.0205). The study also found that the highest adopted reverse logistics practice was resale of returned products after repairs with a (mean = 4.41, SD= 0.891), followed by replacement of goods returns from customers with a (mean=4.31, SD= 1.114). The least reverse logistics adopted by the firms was repairs of returned goods with a (mean =4.17, SD=1.058). Regression analysis revealed that there is a positive relationship between reverse logistics with the performance indicators of manufacturing firms that include lead time reduction (p=0.281); Reduced customer returns with (p =0.598) and cost reduction (p=0.948) are not significant as $p \geq 0.05$

The study revealed that green policy and regulation practice to the large extent has been adopted in the Manufacturing firms in Nairobi County with a (mean =4.49; SD=0.747). It shows that the

most adopted green policy and regulation practice with a (mean =4.72; SD= 0.530) is use of environmentally friendly practices to ensure that emissions are minimized. This is followed by placement of measures to ensure that the manufacturing process is environmentally friendly with (mean = 4.42; SD= 0.878) and lastly was adoption of waste reduction techniques with (mean =4.32; SD= 0.834). Correlation analysis revealed that green policy and regulation has a strong positive correlation with the performance indicators of manufacturing firms that include with product value with (r=0.898), cost reduction with (r=0.891), lead time reduction with (r=0.462) and reduced customer returns with (r=0.595) while regression analysis showed that t there is a positive correlation between green policy and regulation with the performance indicators of manufacturing firms that include with product value with (p=0.455), cost reduction with (p=0.715), lead time reduction with (p=0.639) and reduced customer returns with (p=0.709) but was not significant as the p- values were greater than 0.05.

The study further revealed that sustainable supply chain collaboration to a moderate extent has been adopted in the Manufacturing firms in Nairobi County with a (mean =3.83; SD=0.1.296). The firms ensure transparency in coordination between internal and external stakeholders to a moderate extent with a (mean =3.99; SD= 1.24). It also shows that moderately throughout the firm, there is real time shared visibility and processes with supply chain partners with (mean =3.67; SD 1.351) and from correlation analysis, the study revealed that that sustainable supply chain collaboration has a strong positive correlation with the performance indicators of manufacturing firms that include with product value with (r=0.834), cost reduction with (r=0.839), lead time reduction with (r=0.465) and reduced customer returns with (r=0.769). Regression analysis showed that sustainable supply chain collaboration has a positive and significant correlation with the performance indicators of manufacturing firms that include with product value with (p=0.014) and cost reduction with (p=0.017). However the correlation of sustainable supply chain collaboration and the performance indicators of manufacturing firms that include lead time reduction with (p=0.099) and reduced customer returns with (p=0.204) is not significant as the p-values were greater than 0.05 .

Lastly, Descriptive analysis revealed that Product design practices have been adopted to a large extent in the Manufacturing firms in Nairobi County with a (mean =4.07; SD=1.213). On a continuous basis, the company creates systems that ensure varied product designs with (mean = 3.73; SD=1.323). Firms also have put in place a team to review the product designs regularly as per market requirement shown with a (mean = 3.96; SD=1.327) while majority of respondents agree to large extent that the firms guarantee that products come in a variety of shapes and sizes to meet the needs of the end consumers as indicated with (mean = 4.51; SD=0.989) and from correlation analysis, the study revealed that that Product design practices has a strong positive correlation with the performance indicators of manufacturing firms that include with product value with (r=0.875), cost reduction with (r=0.791), lead time reduction with (r=0.542) and reduced customer returns with (r=0.711). Regression analysis shows that Product design practices has a positive and significant correlation with the performance indicators of manufacturing firms that include with product value with (p=0.008) However the correlation of sustainable supply chain

collaboration and the performance indicators of manufacturing firms that include cost reduction with (p=0. 0.407), lead time reduction with (p=0.371) and reduced customer returns with (p=0.094) is not significant as the p- values were greater than 0.05

Conclusion

A regression model, established the relationship between the circular supply chain practices and their influence on performance of manufacturing firms in Nairobi County. It revealed that 89.2% changes in supply chain performance of manufacturing firms in Nairobi County is as a result of circular supply chain practices (R^2=0.892) The findings of this study are similar to (Botezat et al., 2018)who found out that circular economy practices of Romanian producers significantly affected the economic and environmental achievement of firms. (Ochiri et al., 2015)in their findings concluded that the introduction of waste reduction would actually improve the performance of publishing firms; The findings are as well in line with the study by (Omar & Nairobi, 2020) who found out that product recycling and reuse have a positive impact on how successful the companies were operationally.

The study concluded that manufacturing firms have used circular supply chain practices including reverse logistics, green policy regulation, sustainable supply chain collaboration and product design. The companies adopted the practices of accepting returns, repairing returned goods, replacement of goods returned and reselling repaired goods. The firms have also put in place measures to ensure that the manufacturing process is environmental friendly and have adopted waste reduction measures. In addition the firms have practiced transparency in coordination between internal and external stakeholders and ensure real time shared visibility and processes with supply chain partners. Finally, firms on a continuous basis crates systems to ensure varied product designs, put in place a team to review product designs regularly and guarantees that products come in a variety of shapes and sizes to meet market demands

Recommendations

Based on the conclusions, the researcher recommends that management of manufacturing firms should put in place mechanisms to improve the circular supply chain practices since they have a significant positive effect on their firm's performance. The firms should put in place mechanism to improve reverse logistics, green policy regulation, sustainable supply chain collaboration and product design practices. Further, the government should formulate adequate policies that would provide a good framework to make use of circular supply chain practices. The management of these firms should also formalize adoption of circular supply chain practices through written down policies, guidelines and regulations provided by the industry regulators.

REFERENCES

Afum Ebenezer, & Zhuo, S. (2019). Reverse Logistics and Performance of Bottled and Sachet Water Manufacturing Firms in Ghana : The Intervening Role of Competitive Advantage. *JOSR Journal of Business and Management*, *21*(4), 39–49. https://doi.org/10.9790/487X-2104043949

Agenda, P. (2022). *PRIORITY AGENDA 2022 Manufacturing sector recovery and sustained growth for Kenya ' s shared prosperity*.

Ballantyne, D., & Varey, R. J. (2016). Creating value-in-use through marketing interaction: The exchange logic of relating, communicating and knowing. *Marketing Theory*, *6*(3), 335–348. https://doi.org/10.1177/1470593106066795

Barr, B., & Accenture. (2014). *2014 {State} of {B}2B {Procurement} {Study} - the {Shifting} {Landscape} in {B}2B {Commerce}. 2014 Report*, 1–12. https://www.accenture.com/gb-en/insight-state-b2b-procurement-study-uncovering-shifting-landscape

Barra, Ricardo and Leonard, S. A. (2018). *Plastics and the circular economy. Scientific and Technical Advisory Panel to the Global Environment Facility. June*. https://stapgef.org/sites/default/files/publications/PLASTICS for posting.pdf

Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. (2018). Experimenting with a circular business model: Lessons from eight cases. *Environmental Innovation and Societal Transitions*, *28*, 79–95. https://doi.org/10.1016/j.eist.2018.02.001

Botezat, E. A., Dodescu, A. O., Vaduva, S., & Fotea, S. L. (2018). An exploration of circular economy practices and performance among Romanian producers. *Sustainability (Switzerland)*, *10*(9). https://doi.org/10.3390/su10093191

Candi, M., & Gemser, G. (2010). An agenda for research on the relationships between industrial design and performance. *International Journal of Design*, *4*(3), 67–77.

Chen, J., Viardot, E., & Brem, A. (2019). Innovation and innovation management. In *The Routledge Companion to Innovation Management* (Issue September 2020). https://doi.org/10.4324/9781315276670-1

Chome, N., Gonçalves, E., Scoones, I., & Sulle, E. (2020). 'Demonstration fields', anticipation, and contestation: agrarian change and the political economy of development corridors in Eastern Africa. *Journal of Eastern African Studies*, *14*(2), 291–309. https://doi.org/10.1080/17531055.2020.1743067

D'Ippolito, B. (2014). The importance of design for firmscompetitiveness: A review of the literature. *Technovation*, *34*(11), 716–730. https://doi.org/10.1016/j.technovation.2014.01.007

Gellynck, X., Molnár, A., & Aramyan, L. (2018). Supply chain performance measurement: The case of the traditional food sector in the EU. *Journal on Chain and Network Science*, *8*(1),

47–56. https://doi.org/10.3920/JCNS2008.x088

Gokmen, G., Vermeulen, W. N., & Vézina, P. L. (2020). The imperial roots of global trade. *Journal of Economic Growth*, *25*(1), 87–145. https://doi.org/10.1007/s10887-020-09174-7

Kenya National Bureau of Statistics. (2021). Economic Survey Report 2021. In *Economic Survey 2021*. https://www.knbs.or.ke/?wpdmpro=economic-survey-2020

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Koretz, D., Merikangas, K. R., Rush, A. J., Walters, E. E., & Wang, P. S. (2013). The Epidemiology of Major Depressive Disorder: Results from the National Comorbidity Survey Replication (NCS-R). *Journal of the American Medical Association*, *289*(23), 3095–3105. https://doi.org/10.1001/jama.289.23.3095

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, *127*(April), 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005

Magout, M. (2020). CHAPTER THREE – Research Methodology. *A Reflexive Islamic Modernity, March*, 57–84. https://doi.org/10.5771/9783956506376-57

Mauti, R. N., & Muturi, W. (2018). Influence of Internal Controls on the Financial Performance of Tea Processing Firms in Kenya: A Case of Nyamira County, Kenya. *IJARKE Business & Management Journal*, *1*(1), 57–69. https://doi.org/10.32898/ibmj.01/1.1article13

Mwanyota, J. L. (2021). *Reverse Logistics, Process Innovation, Operational Performance and Competitive Advantage of Manufacturing Firms in Kenya*. *IX*(7), 156–174.

Ochiri, G., Wario, G., Odhiambo, R., & Arasa, R. (2015). Effects of Waste Reduction Strategy on Firm Performance: a Survey of Publishing Firms in Kenya. *International Journal of Economics, Commerce and Management United Kingdom*, *III*(5), 1228–1241. http://ijecm.co.uk/

Omar, O., & Nairobi, O. (2020). *Effect of Circular Economy Practices Onsupply Chain Performance of Chemical and Allied Sector Firms in Kenya By a Research Project Report Submitted in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Business Administration* .

Samson, D. K. (2018). *Relationship between Reverse Transportation and the Performance of Imported Furniture Distributing Firms in Nairobi County*. *5*(2), 1095–1105. https://semanticscholar.org/paper/62e8b8204ac4c22f86125eff4eb718a0689ce27f

Seebacher, G., & Winkler, H. (2013). A citation analysis of the research on manufacturing and supply chain flexibility. *International Journal of Production Research*, *51*(11), 3415–3427. https://doi.org/10.1080/00207543.2013.774483

Shukla, S. (2017). Research design Research design. *Research in Social Science:*

Interdisciplinary Perspectives, *September*, 68–84. file:///E:/Documents/dosen/buku Metodologi/[John_W._Creswell]_Research_Design_Qualitative,_Q(Bookos.org).pdf

van der Puil, J., & van Weele, A. (2013). International contracting: Contract management in complex construction projects. *International Contracting: Contract Management in Complex Construction Projects*, *2001*, 1–490. https://doi.org/10.1142/P894

Vlachos, I. P. (2016). Reverse logistics capabilities and firm performance: the mediating role of business strategy. *International Journal of Logistics Research and Applications*, *19*(5), 424–442. https://doi.org/10.1080/13675567.2015.1115471