SUPPLY CHAIN DESIGN AND PERFOMANCE OF STATE OWNED SUGAR FIRMS IN KENYA

Evans Misiko Wambasi

A Thesis Submitted in Partial Fulfillment of the Requirements for the Award of Degree of Master in Business Administration (Operations Management Option) of Masinde Muliro University of Science and Technology

April, 2024

DECLARATION

This Thesis is my original work and has not been submitted in this or any other university for an academic award.

Signature…………………………..   Date ………………

Misiko E Wambasi

MBA/G/76/12.

CERTIFICATION

The undersigned have read and hereby satsfactorily recommend for acceptance of Masinde Muliro University of Science and Technology a thesis entitled *"Supply Chain Design and Perfomance of state-owned Sugar Manufucturing Firms in Kenya"*

Signature ………………………….   Date………………………………….

Dr. Fredrick Njeru Kiongera.

Department of Business Admnistration and Management.

School of Business and Economics.

Masinde Muliro University of Science and Technology.

Signature …………………………   Date…………………………………..

Dr. Dishon Munuhe Wanjere.

Department of Business Admnistration and Management.

School of Business and Economics.

Masinde Muliro University of science and technology.

COPYRIGHT

DEDICATION

I dedicate this to my beloved wife Purity Watitwa and the children plus all those good people who aspire for good things and work towards attaining them. The dedication is further extended to my son, daughter, brothers and sisters for the constant support and motivation.

ACKNOWLEDGMENTS

ABSTRACT

The primary goal of supply chain design is to up service quality and improve interaction levels between service providers and customers.The study was guided by four objectives aimed at establishing effect of facility location, Operation assessment, Inventory reduction on performance of state owned sugar firms and the moderating effect of organizational factors on relationship between supply chain design and performance of state-owned sugar manufacturing firms in Kenya. The research employed descriptive casual research design to provide cause effect relationship between study variables while applying simple stratified purposive sampling technique to collect data. The target population comprised all the four operating state owned sugar firms namely, Chemelil, Muhoroni, Sony and Nzoia constituting four (4) factory managers, four (4) Finance managers, five hundred and twenty four (524) Agriculture Extension Officers, four (4) Human Resource managers, One hundred and eighty (180) Agriculture services Personnel and four (4) Strategy and planning Managers totalling to 720. The researcher used questionnaires for data collection. Analysis of data was executed by descriptive and inferential statistics. Statistical Package for Social Sciences (SPSS) helped in the analysis. Results presentation was in form of tables, figures, charts as well as histograms. Descriptive analysis facilitated the researcher get opinion percentages on the research issue. Hypothesis was tested at 95% confidence level. In determining the objectives, the hypotheses " H_{oi}: H_{o2}; H_{o3} and H_{o4} have insignificant relationship to performance of state owned sugar manufacturing firms in Kenya" were set and tested sequentially; the hypotheses were rejected consecutively; hence facility location, Operation assessment, Inventory reduction and the moderating effect of organizational factors on the relationship between supply chain design and performance had significant positive effect on performance of selected sugar manufacturing firms in Kenya. Simple Regression Analysis helped determine the strength and direction of the relationship between study variables. Facility location, operational assessment, inventory reduction and the moderating effect of organizational factors contributed greatly in the improvement ofperformance of the selected State owned Sugar Firms.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

PDT   Product development team.

Dfsc   Designs for supply chains.

SOA   Service Oriented Archtecture.

OEM   Original Equipment Manufucturer.

PDTs   Planning Design Technologies.

DDD   Design For Demand.

BTO   Build To Order.

BTS   Build To Stock.

SAT   Serviceability Assesment Tool.

FTL   Full Truck Load.

LTL   less Than Full Truck Load.

VPR   Vehicle routing problem.

S & OP   Sales and operation planning.

FL   Facility location.

OA   Operation Assesment.

IR   Inventory reduction.

MS   Market share.

CR   Cost Reduction.

PM   Profit Maximisation.

NSC   Nzoia Sugar Company.

CSC   Chemelil Sugar Company.

SSC   Sony Sugar Company.

OPERATIONAL DEFINITION OF TERMS.

Sugar firm   A limited liability company which mills cane grown in its canfarm or from farmers to produce sugar and related products for sale in the domestic market or for export

State owned firm   Where government has more than 50% ownership.

Supply chain   The interaction between people, infrastructure, communication, material components of a service, service providers and customers.

Cogeneration   Generating power for export to national grid using steam turbine driven generator; where such steam is generated from boiler fired by excess bagasse.

Facility Location   Is the ideal placement of facilities to lower transportation costs

Supply Chain Design   Supply Chain framework aimed at improving service quality and interaction levels between customers and service providers.

Independent demand   The need for various items that are not related to each other.

Inventory position   The amount on-hand, on-order less backordered quantities.

In situation where inventory has been marked for special reasons,the inventory position is minimized by these specific amounts.

Inventory   The stock of any item or resource used in an organization.

Safety stock   The quantity of inventory carried on top of the expected demand.

Sourcing strategies   Sub-system and global sourcing.

Social network design   Contract, information and relationship flows.

Building blocks   Specified investments to implement design decisions.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

The remarkable trend in the world economy over the past three decades has been growing global economic integration, (Adejumo, 2017). It has exposed manufacturers to regional and global competition especially where many players are producing similar products. The sugar industry has not been spared the steep competition. Presently under a liberalized industry, wholesalers buy directly from the sugar mills for distribution, (Wanyande, 2018).According to, (Wanyande, 2018), these circumstances make imported sugar much cheaper than locally produced sugar encouraging the dumping of cheap sugar in the local market. This threatens the survival of the local sugar industry and yet Sugar cane farming is a source of income to over 150,000 stake holders(Marangu, 2016).

The sugar firms have opted for diversification strategies (Marangu,2016). Every production firm aims at maximizing its profits by developing a competitive advantage over its rivals. Diversifying means developing a wide range of products, interests, or skills in order to minimise risks. It involves acquiring different investment alternatives to spread the risk(Nickels, 2018). The other system that the Kenyan sugar industry could adopt is "supply chain" design genenerally involvingprocessing and critically where to locate firms, distribution centers, weighbridges, bridges and culverts, (Conea, 2019).Supply chain is designed to control inventory hence inventory management models form critical aspects of supply chain design. Supply chain design is the set of policies and controls that monitor levels of inventory and determine what levels should be maintained, when stock should be replenished, and how large orders should be done.

Conventionally, inventory in manufacturing refers to items that contribute to a firm's product output, (Wiley, 2017). Supply chain is classified into raw materials, finished goods, component parts, supplies, and work in progress. In distribution, supply chain is classified as, being moved in the system, and in storage, or distribution stores. Retailers carry inventory for immediate sale to consumers.In services, inventory is the tangible goods for sale and the necessary supplies for administration(Nickels, 2018). World sourcing and the migration of value-added logistical services are certainly primary drivers but other opportunities have come into play in recent past making direct-to-store shipments possible. Information technology linkages between supply chain partners have allowed coordination and collaboration among supply chain segments.

Temporarily, at the front of the chain, sophisticated point-of-sale systems capture product demand patterns,(Virginia Mescher, 2017). The information is then fed up the chain to manufacturers and suppliers. Accurate sales-forecasting tools take the guesswork out of production and reduce the need for large inventory safety stocks. Tracking and tracing tools are available to follow orders across borders and through the hands of different supply partners. Summarily, companies no longer need inventory in warehouses for they can synchronize production and distribution with demand using information technolgy.(MC Graw-Hill, 2018).

1.1.1 Sugar Manufacturing Sector in Kenya

Sugarcane, (Saccharum officinarum) is a scientific name for tropical grass native to Asia,(Sugarcane). It has been grown for over 4,000 years. Christopher Columbus likely brought the plant to the west indies. Today, about 75% of the worlds sugar comes from sugarcane. Sugarcane was one of the first cash crops of early colonial America. It grew plentifully in the southern states and was a major source of income for many plantations.

High labor costs in the United States led to the industry's rapid conversion to mechanical harvesting in the early 1990's (Mescher, 2020).In 1966, Kenya was importing about 70% of her sugar requirements but by 1976, domestic production stood at about 296,000 MT while consumption demand stood at about 253,000 MT. However, this changed and Kenya is now a net importer of sugar.

Small scale producers dominate the sub sector.As the beginning of 2000, nearly 88% of total area of about 108,793 hectares belonged to small scale growers. It is the main source of income to over 200,000 more people in the agro processing, distribution and other related services. It's share of the agriculture GDP is nearly 7% (PKF Consulting ltd, 2005). Early attempts to streamline the sugar industry were unsuccessful and brought about confusion. In 1994, the government released a paper called the Sugar Sub Sector Restructuring Study (SSRS). The study proposed, selling shares, (Chemelil), hiring technical consultants and introducing performance based contracts (Sony, Muhoroni and Nzoia) and privatization (Nzoia and muhoroni).

The proposals did not go well with the farmers who claimed they were not consulted. During that period, the government begun liberalizing markets and privatizing some parastatals. This was done without legal or policy frame work in place. Trade liberalization for the sugar sub sector eliminated barriers restricting the flow of trade and eliminated price controls. This caused in an increase in trade rather than in productivity and competitiveness in the local industry. Oversupply was harmful to local producers who were unable to dispose off their higher priced products. Trade liberalization at that time had negativeresults as the local industry had not been cushioned to develop sufficiently to meet its challenges.

Following this crisis that led to the near collapse of the industry, the Sugar Act, (2001) was enacted to bring sanity to the industry. The Act was activated in 2002. It empowered the Kenya Sugar Board, (KSB) to develop the industry and its regulations. KSB, replaced the Kenya Sugar Authority (KSA), which had been set up in march 1973 to try and promote the development of the industry but failed, (PKF Consulting ltd, and Wanyande, 2020).

1.2 Statement of the Research Problem

Asuccessful production has timely deliverables that depend on accuracy and timeliness of a vast amount of information,(Janvier- James, 2019). Field officers spend more than 50% of their time in the field where data is difficult to access away from the site office. Field operations and services experience extensive delays and rework due to information that is unavailable, inaccurate or outdated as a result of manual processes. Delays and rework reduce the overall productivity of the firms and increase indirect costs due to schedule delays or direct costs due to work(Larson, Halldurson, 2019).

The Kenyan Sugar industry continues to exhibit lack of competitiveness in the regional and global sugar market as confirmed by repeated requests for continued extension of COMESA safeguards by the government, (Privitization Commission Ref: PC/T/ 08, 2010 and Ref PC/ TRA/ CONF/ 10, 2013). The government has continued to apply for and secure protection of the local sugar industry against imported sugar. This means the cost of sugar production in Kenya is still higher than the global prices. This inability to compete in a free market economy has seen Muhoroni and Miwani sugar mills put under receivership (Privatization Commission Ref: PC/ T/ 08, 2019).

This is due to Kenya's inadequate adjustment to liberalization and globalization forces, which have affected the competitiveness of the sector.In the era when COMESA safety

guards are about to lapse, the Kenyan sugar industry needs to do something about its cost of production to become competitive, (Privatization Commission Ref PC/ TRA/ CONF/ 10, 2013).Supply Chain Design is a subject well studied in Europe, America and Japan with results being implemented for competitiveness,(Gunderson, 2021). Related studies in the Indian sugar industry have focused more on diversification, according to, (Nangare & Kulkami, 2021), but little study has been done in Kenya.

The few related studies done in the Kenyan sugar industry have been found to focus on diversification,(Marangu, Oyagi, & Gongera, 2021) and management Politics,(Wanyande, 2021). This study seeks to fill this gap by determining the effect of supply chain design on performance of state owned sugar manufacturing firms of Kenya,(Coltrain, 2019).

1.3   Research Objectives

1.3.1General Objective

The general objective of the study was to establish the effects of supply chain design on performance of state owned sugar manufacturing firms of Kenya.

1.3.2 The specific objectives were:

(a) To establish effect of facility location on performance of state owned sugar firms in Kenya.

(b) To investigate effect of operationassessment on performance of state owned sugar firms in Kenya.

(c) To examine effect of inventory reduction on performance of state owned sugar firms in Kenya.

(d) To interogate the moderating effect of organizational factors on the relationship between supply chain design and performance of state owned sugar firms in Kenya.

1.4 Hypothesis

HO_1: Facility location has insignificant relationship withperformance of state owned sugar firms in Kenya.

HO_2: Operation assessment has insignificant impact on performance of state owned sugar firms in Kenya.

HO_3: Inventory reduction has insignificant impact on performance of state owned sugar firms in Kenya.

HO_4: Organizational factors have insignificant influence on the relationship between supply chain design and performance of state owned sugar firms in Kenya.

1.5 Scope of the Study

This study developed an adoption framework for supply chain design in state owned sugar manufacturing firms inKenya. It was carried out in the four operating state owned sugar manufacturing firms inKenya. The selection of the area was based on the fact that companies have a fairly high percentage of supply chain design scope on their business operations which is representative of other sugar manufacturing firms within a similar competing environment. This enabled generalization of results across other six sugar companies that are operational.

This study on effect of supply chain design on performance of state owned sugar manufacturing firms of Kenyacovered the four operating state-owned sugar

manufacturingfactories namely;   Sony Sugar, Chemelil Sugar, Muhoroni Sugar and Nzoia Sugar.

1.6 Study Limitations

The setbacks of the study were finances to travel while collecting data and limited literature on topic of study within the sugar firms. This was overcame by using linkages in the industry so that interviewees were readily available when visits were made. Reference was made to studies done on topics similar to our specific objectives but for different industries. The researcher approached top management of the factories under study to explain the importance of this research so as to access information needed.

1.7 Relevance of the Study

Supply chain, Value Chain, Dynamic capabilities and Resource dependence theories are all used in the research. Supply Chain was the main theory used in the study. These theories were not thoroughly interrogated in supply chain design literature. The study shall advance the frontiers of knowledge by providing additional insight on the link between   design of the supply chains, facility location, operation assessment and inventory reduction and may offer new practical contributions. It shall also help fill the gaps found in prior research and promote performance of   state owned sugar manufacturing firms in Kenya.

Policy making institutions like the Government of Kenya, Treasury, Agriculture Ministry and others   shall benefit from a critical understanding of how they can formulate policies to help local firms gain more from globalization of markets. The insight shall help in the formulation of policies that promote greater spillover in manufacturing sector and other critical economic sectors. Manufacturing firms will benefit from the study since managers shall build the requisite supply chain design

techniques in their firms to ensure they maximize the benefits. The investors in the manufacturing sector will also lobby the government in working towards improving the manufacturing business environment. It was thus critical to analyse the effects of supply chain design in any manufacturing sector.

The Kenyan sugar manufacturing firms require to get competitive in the globalized world. The study brought out the benefits supply chain design can accrue on delivery schedules, inventory reduction, increased profit, operations independence, variation in product demand, flexibility in product scheduling and accurate forecasting, coming up with appropriate policies and guidelines on supply chain design in manufacturing sector and specifically on the ailing sugar industry to be competitive. The findings will help the regulator, Kenya Sugar Directorate on strategy formulation for the ailing sugar firms. The study is also expected to be helpful to private sugar firms who share the same business environment with state owned firms especially competition from cheap imported sugar.

 Potential investors shall also benefit from this study as it gave an indication of the viability of the industry. Managers in both the state owned and the private firms are expected to gain from the findings in guidance towards policy formulation. To the academia, the study shall beef upstudy particularly inmanufacturing sector for increased performance especially in the sugar firms and encourage further investigation in the area of performance based on supply chain design.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The chapter highlights literature review. Literature was reviewed from journals, books, working papers, reports and periodicals. Literature review helped acquint the researcher with existing theoretical issues and previous studies on supply chain designed manufacturing on firms performance. This chapter sets out the theoretical review of manufacturing firm's production performance, empirical review, conceptual framework, critique and research gap.

2.2 Theoretical Foundation

The emphasis in this section is on breadth of theoretical perspectives. The concepts of this study are grounded in four theories; supply chain theory, value chain theory,Dynamic capabilities theory and theresource dependence theory. The main theory of the study is the supply chain theory.

2.2.1 Supply Chain Theory

A small number of influential factors, foundational elements heavy production outputs; (Lambert, Cooper & Pagh, 2018), not only does the supply chain contain, but it also has critically affected global environmental factors. Factors include key customers, businesses, the product's life cycle and the technological adjacency. Supply chain architecture dominates, (Lambert, 2018). The design space in which critical decisions are made, the aforementioned factors act as constraints on such decisions. This process includes budgetary allocations, sourcing strategies and network infrustructure layout.

Creating a sociol support system, collaboratively managing behaviour and governing reltionships vs. Contracting, (Cooper, 2018). Despite a wealth of literature empasizing

the concept, clarifying the design process, studies linking influencers to design choices required are especially important to carry out (Paugh, 2018). No knowledge about varying supply chains exist when working with a diverse set of opinion leaders. Decisions must be made early in the products lifecycle, (Melynk, 2020). Because of the depth and complexity of the concept, it is critical to analyse comprehensively all the three dimensions at the same time.

Furthermore, the framework indicates which questions have been resolved and which have not; Vishwanathan, (2019).
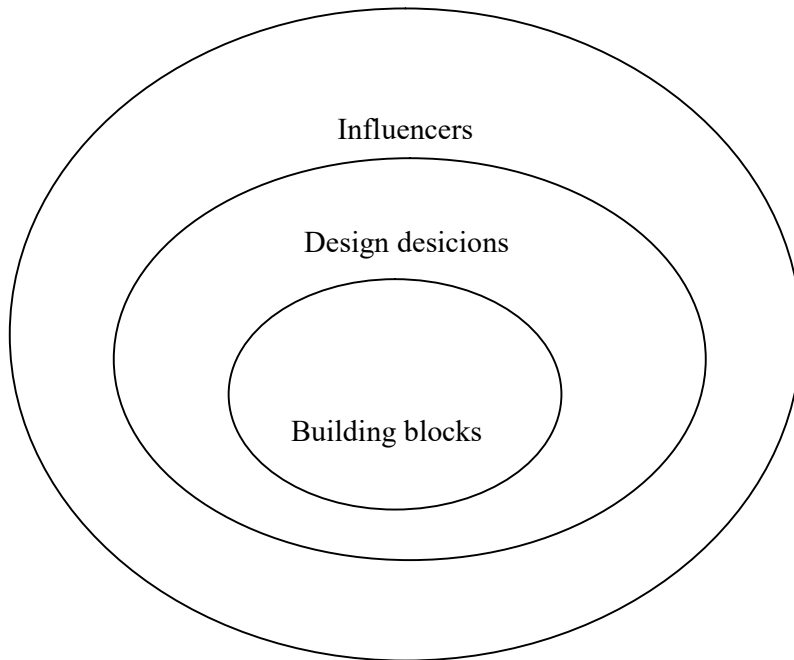
Figure 1. 1: Three dimensions influencing supply chain

Source: Vishwanathan, (2019).

The manufacturing value chain with a staircase of improvements, (Fisher, 2017) contends that a products supply chain should prioritize responsiveness and efficiency. It is critical for supply chains to have efficient manufacturing facilities at each link. However, (Pettit & Beresford, 2019), discover that cutting-edge facilities collaborate

with partners further down prioritizing supply chain adaptability over partners further up who give priority to supply chain efficiency. Normal fluctuations occur where there is a single goal or should it be sub-divided into sub-chains so that each link can be optimized independently considering cost and innovative output.

Using statistical models, this approach attempts to quantify how closely product complexity can cause disruptions. As a product complexity increases, four major design factors influence its efficiency; Purchase decision, Cargo transportation mode, proposal to divide and merge large urban areas and area of supply chain origination. Planning must account for product complexity across all four dimensions. According to (Fisher, 2017), changing supply chain designs are necessary due to increasing complexity of the products being processed. Any businesse's supply chain strategy is important to its success.

The framework is adaptable to either a centralized or decentralized "supply chain" depending on organizational requirements. The model may be able to use individual capabilities or combine them to meet the requirements. The models sourcing strategy takes three factors into account; minimum requirements, norms, and characteristics. This demonstrates the value of meticulous planning and execution during the design phase whenever unusual "supply chain" results are expected, (Beresford, 2019). Manufucturers may not always have diversified range of suppliers whose prices based upon the free market economy. When faced with few or no viable supply alternatives, some businesses conclude that sourcing and incooporating both inhouse and external production is required.

Changes can improve "supply chains" responsiveness. Innovation velocity, and environmental friendliness. More knowledge means more opportunities for design

improvement, (Wackenhole, 2016). Supply chains are classified like products into three distinct phases; we can examine what factors are most important at each stage and how to transition between the stages as smoothly as possible if we recognize that "supply chains" develop in stages. Therefore this study grounded its strength regarding organizations interdependence with supply chain theory as one of the theoretical underpinnings. This theory has been criticized, as it does not explain the development or acquisition of new capabilities and adaptation to new situations by organizations.

Finally when viewed through the lenses of, "Value chain" and Supply Chain ethos, the design adoption framework makes sense. The flaws of each theory are also discussed. The study's theoretical foundation was strengthened by combining ideas from several of these schools of thought.

2.2.2 Value chain theory.

In todays volatile market, the supply chain has become so critical, (Chee & Billington, 2020; Lee, 2020 & Melynk, 2021). A company can reap many benefits by maximizing the capacity, work with the firm and by building and nurturing the right relationship with both customers and suppliers, including smaller stockpiles, lower costs, faster reaction times, and the sharper focus in product development, production, and capital expenditures; (Havard, 2006). The concept is not new, but rather one that evolves over time as more data is analysed. Providing support for value chains effect on performance, (Kransdorff, 2012). Since then, the sector has been the force behind development and expansion.

This concept arose shifting industry needs. As a result, until recently, the concept lacked a theoretical foundation; instead, studies focused on defining the field and its subfields. According to (Harrington, Boyson & Corsi; 2019), they emphasized the

signifigance of the concept as the driving force behind such large investments. (Fine, 1998),finally admitted, after years of denial, that the theory has weaknesses in that make/ buy decisions, buyer- supplier dynamics, and the vertical integration can not account for growth of the manufucturing firms. However, the theories main flaw is failure to explain measured financial output of the businesses.

The importance of the strudy is to understand the value of tailor made supply chains, characterising, explaining, and forecasting cooporative and supply chain- level activities and outcomes. The study's goal was to know more about supply chain design by determining which factors are ideal and how they relate to perfomance, and under what conditions, specific designs are required, (Hull, 2015). According to (Hussain, Assavapoke, & Khumanawala, 2019); a company's tailor made supply chain determines its investment patterns across its supply chains, (see figure below). Resultant decisions made here will have far- reaching consequences for the issues that the concept can solve; (Wo, Melynk, & Finne, 2018).

The theory has flaws for not specifying about wether we are dealing with the concept or its sub-tittles. This is why we support Synder's term, (2013). Given the increasing importance of the concept in both business and academia, we've discovered that the best management strategies are well thought-out and targeted toward specific outcomes. According to (Melynk, 2017) a value-driven, strategically placed chain is replacing the traditional, price-driven, strategically decoupled one. This shift was brought about by strategic investments and proactive management aimed at amassing and organizing the most advantageous resources possible to ensure the firm's market success.

The theory neglects possession of valuable resources and is more oriented toward the strength of a company to exploit its resources and make them fit changing needs, (Teece

& Al-Aali, 2013). Despite criticism, the function of value for supply chain is linked to involvement in generation of critical information important for capabilities inside the companies, (Zahra & George, 2002). concept that considers technological advancement, company culture, and proximity. To reap all of the benefits, it is clear that new types of chains will require to be tailored to account for the numerous factors already mentioned.

2.2.3 Dynamic Capabilities Theory.

The concept was developed in management literature in 1980s and a theory published by (Teece & Pisano,1994). (Zahra Garvis,2000), argued that dynamism reflects the instability of a firm's market conditions emanating from the constant unpredictability of customers leading to shifting situations and provoking searches for new sources of competitive advantage. Further, (Edelman & Yli-Renko,2010) observed that dynamism creates new sets of opportunities that could elevate the competitive ability of a company.

The dynamic capabilities framework is premised on a holistic approach constituting entrepreneurship, ownership advantages, knowledge creation and sustainable advantages; (Teece & Al-Aali 2013). The proponents claim that companies should be in a position to build, reconfigure and skillfullyblend all forms of competencies to capitalize on them; (Teece, Pisano & Shier, (1997). The theory leads to the formation of strategic routes within organizations that allow them to alter resource bases through integration and acquisition to cultivate strategies that help them to generate value,(Grant, 1996)identified, organizational routine and knowledge articulation as three mechanisms that interact to develop dynamic capabilities and improve already existing organizational routines by forming social processes that facilitate organizations to acquire, integrate, transfer and create knowledge.

Knowledge absorption, integrative ability, social networking and market oriented sensitivityare used to negotiate and communicate dynamic capability measures, According to(Feiler & Teece, 2014), it's noted that dynamic capability could be either geared toward transforming, seizing or sensing,(Wang & Ahmed,2007) added that dynamic capability could be thought of adaptive, innovative and absorbtivecapability components.Dynamic capabilities theory has been condemned as lacking a precise definition and clear theoretical foundation, empirical grounding and measurements, making it hard for scholars to study the way dynamic capability can be utilised in the development and assessment of hypotheses and predictions as well as decision making processes,(Pavlou & El Sawy, 2011).

The theory is also characterized by weakness in accounting for how firms can develop or acquire such capabilities. However, the theories flaw is failure to explain measured financial output of the businesses. The theory also overlooks possession of valuable resources and is more oriented toward the strength of a company to exploit its resources and make them fit changing needs,(Teece & Al-Aali,2013). Despite criticism, the function of design for supply chain is linked to involvement in generation of critical information important for capabilities inside the companies,(Zahra & George,2002).

2.2.4 Resource Dependence Theory

Originally composed this view, which is grounded on the firms interaction with the environment(Pfeffer & Salancik, 1978),. The theory proposes that organizations have a symbiotic relationship with their environment and this dependence on the environment leads them to be externally constrained and controlled. Organizations engage in exchange with their environment by forming coalitions, altering their organizational systems to obtain required resources. They reasoned that organizations need numerous kinds of resources to undertake their businesses and these resources define how firms generate and make deliveries of their products or services to the market, (Pfeffer & Salancik, 2003)

Organizations are interdependent in that they seek resources including monetary and physical resources, technology, management skills, marketing expertise, information and sociol legitimacy among others. Through such interdependence, organizations can combine their resource sets synergistic-ally with complimentary resources of partners thereby creating bundles that are unique and difficult to replicate,(Harrison, Hitt, Hoskisson & Ireland, 2001). Therefore the study grounded its regarding organizations interdependence with supply chain on resource dependence theory as one of the theoretical underpinnings. The resource dependency theory has been criticized, as it does not explain the development or acquisition of new capabilities and adaptation to new situations by organizations.

2.3 Empirical Studies Review

This research was intended to bring out the link between facility location, operation assessment and production output of the mentioned state owned sugar firms in Kenya. Uniquely, it asked what evidence is available regarding the interrelationships involving

the variables. A review of recent empirically published research relating to these variables of interest is presented. The key results from the academic sources are critically appraised to recognize the strong and weak areas of the empirical research.

2.3.1 Facility Location and Manufacturing Firm Performance

The discussion highlights value of location decisions in "supply chain". We revisit classical models and develop a summary on more recent research targeting to expand the concept of decisions including extra features of "supply chain". It critically examines transport routes, management of inventory, robustness and reliability;(Al –Sultan, AL-Fawzan, 2019). (Simchi- Levi, Kaminisky & Samchi Levi 2003 p5). The figure is frequently much higher in some fields when the value of transporting a complete product to the user is considered.

According to Averbakh, (2020), location decisions are the most difficult in designing. Raw material availability, labor costs are all factors that influence transportation and inventory decisions. Changes in business alliances and partnerships may necessitate revisions to policies governing the release of corporate information that critically influences location decisions (Balicik,2019).Inefficient locations for manufacturing plants, distribution centres, shallresult in extra costs in the facilitie's lifespan, regardless of the level of organization of the production plans.

However, at the times these decisions reflect uncertainity about the long-term operating conditions of manufacturing plants and distribution centres. Uncertainity surrounds expenses such as shipping and stock storage. When deciding where to locate a facility, planners must consider the inherent uncertainity of future conditions, (Simchi- Levi, 2003). We start with the tried-and –true fixed charge location model and then move on to some alternative, similarly tried-and-true facility location models. We then show how, as

suggested by (Barahoma and Jensen,2008), the tree model can be adjusted to incooporate other aspects of the problem, including more accurate depictions of shipping and receiving processes, inventory management options, and other considerations. Each location has a fixed cost, and we have customer locations with known demands and candidate sites between any given location and any customer, there exists fixed unit shipment costs.

From the view point of (Jaillet, 2015), its examined how the fixed charge obstacle is solved using an algorithm similar to that proposed by (Hemsen & Mladenovic; 2017), due to its similarities, (Glover, and Laguna, 2020),The algorithm has been tested on problems ranging in size from very small to moderately large, yielding positive results. Lagrangian relaxation algorithim, as discussed by (Galvaro & Daskin, 2019) can eliminate the charge location problem..

The fixed charge limitation is extended by (Geoffrion& Graves,2020) to include plant to distribution centres, shipments and multiple commodities.Delivery costs are fixed when transporting a full truckload regardless of the number of stops or the orders made. However, when transporting a smaller quantity, these factors become important considerations, (Eylon, Watson-Gandy and Christofides,2020) raised the issue of treating LTL shipments as full truckloads. Many studies on developing Integrated location/ routing models have been published over the last three decades. The intergrated location / routing problem brings together the supply chain design processes.

Documentation indicates NP-hard vehicle routing challenges are frequently combined to create a problem that is notoriously difficult to solve, (Laporte,2018), compiles recent work on location routing problems; providing various formulations, solution algorithms, and computational results of previous studies in the area. The information was classified

according to the problem and the method used to solve it. Shipping products from the factory via centres to ultimate consumers is a common three layer problem, wherea's two layer problems focus on only those two steps. The formulation by,(Perl, 2013), (Pearl & Daskin,2015); is a good three layer location routing problem.

A three-stage heuristic to reach a conclusion is used by Perl, (2019). Our first step is to look for the least expensive options. The second stage involves making plans for which facilities will be operational. The routes discovered in the first stage will be divided. Third, the available nodesget stabilized and work to improving solution by rerouting customers and solving any outstanding routing issues, (Louvesex, 2017). When the rate of improvement falls below a pre-determined thresh-hold,(Wu, Low, and Bai, 2020), try a related double phase heuristic.

 According to(Laporte, Nobert & Tailleffer, 2018), the vehicle routing problem is typically an interger of the linear programming model. It is an equivalent of three layer Perl formulation (VRP). Indices of flow variable are typically sorted in the VRP's flow formulations, enhanced by the succesful implementation of real algorithims. Theformulationin many ways avoids using traditional locations and routes, she formulates the routes, paths which delivery vehicles may not require in making final trip back to the distribution centre once all deliveries have been completed.

2.3.2 Operations Assessment and Performance of the Manufacturing Firm

Risks and monetary losses can occur in today's globally dispersed supply chains. Optimized warehousing and storage are for lowering operational costs (Simchi-Levi,2003).Automation improves efficiency, and lowers labor costs. Minor gains made using automation, reducing on energy costs in warehouses by applying movement sensor lights, (Berger, 2019). "Supply chains"results in profit loss, (Simchi-Levi 2003). In summary, cost minimization is an operation that companies are tackling especially in their"supply chains". Importantly, saving money as companies focus on leadership (Berger 2019). When consumers demand lower prices and economic growth slows, or even stops, a supply managers focusnaturally shifts tocost-cutting measures. Cost cutting is always on the mind, translating to bottom line- savings.

Quick fixes, such as stock reduction, may help to recover the cash, whereas other solutions, such as streamlining "supply chain" processes and improving planning and forecasting tools, will take long'er to bear fruit. When one part inspects goods before sending them out, and another inspects the same goods upon receipt, the monetary value of the process may be estimated,(Dollani, 2015).

Larger firms in a market's "supply chain" will require the ancilliary provided by the smaller firms, the larger firms may negotiate price breaks for the combined orders. When goods sit in a warehouse without being sold, storing them can quickly outweigh the input. According to (Chen,2019), the company's longterm profitability, customer loyalty, and enterprise risk (the bad kind) may be jeopardized. If cost cutting in the "suply chain" is an option, it must consider both the here, now and the distant future. According to (Rattick and Ravelle, 2019), "supply chain" managers can save money by moving closer

to succeful cost structures in their industry if they first identify key cost drivers and compare them to industry benchmarks.

Because of the unpredictability of customer requests for customization, meeting these needs at adistant productionfacility may be too costly or time-consuming. According to (Ravelle, 2019), inefficiencies in product development can account for up to 80% of total production costs. The design of the "supply chain" influences product handling, storage, and damage.In theory, success is dependent on a harmonious balance of business financial impact of excess inventory, earnings, losses caused by underproduction by using up to date forecasting methods. The Sales and Operation division is perfectly placed to monitor and improve these processes, (Daskin, 2019). When the entire "supply chain" is in equilibrium with demand, "the supply chain" enters the third stage of complexity. The Gartner model's final two stages are "orchestrate" and "collaborative", with the latter two focussing on profit-driven optimization and total enterprise / network coordination, respectively, (Meller, 2020).

2.3.3 Inventory Reduction and Performance of the Manufacturing Firm.

The fundemental inventory costs to take into account are carrying costs and obsolescence risks., (Ozsen& Coullard, 2013).Product design considers facilitation, (Jayaraman & Srivastava, 2018).Supply optimization design model focuses onstrategic decision making or on operational decision making, (Nozick & Turnquist 2008).Stockpiling suppliescan be expensive. It is sometimes necessary to keep some stock on hand to react to customer demands while waiting for more stocks to arrive. Long term storage of products incurs costs that exceed the original selling price. This quarantees that these items are loss leaders, regardless of sales volume, along with (Daskin & Shen, 2019). Reducing

inventory costs saves money by reducing the number of products available (by getting rid of the least profitable or most expensive ones, etc), (Daskin & Shen, 2008).

2.3.4 Moderating effect of organizational factors on relationship between supply chain design and perfomanceof state owned sugar manufucturing firms in Kenya.

Organizational performance is the organizational output as measured against the intended output, orgoals. It includes financial output and shareholder returns. Performance is measured as financial returns (profitability), customer satisfaction(market share), social responsibility, employee stewardship, Porte (1996). If measurementis done by utilizing efforts to produce product or deliver a service, its then called organizational output. Firms vary basing on effect of factors related to objective, and strategic plans to attain them. The factors can be classified into, (economic, sociol, political, admnistrative, organizational purpose and organizational instruments).

The dynamic capabilities framework is premised on a holistic approach constituting entrepreneurship, ownership advantages, knowledge creation and sustainable advantages; (Teece & Al-Aali, 2013). The proponents claim that companies should be in a position to build, reconfigure and skillfully blend all forms of competencies to capitalize on them; (Teece, Pisano & Shier, 1997).

Organizations are interdependent in that they seek resources including monetary and physical resources, technology, management skills, marketing expertise, information and sociol legitimacy among others. Through such interdependence, organizations can combine their resource sets synergistically with complimentary resources of partners thereby creating bundles that are unique and difficult to replicate, (Harrison, Hitt, Hoskisson & Ireland, 2001)

2.4 Study Gap

The investigation done so far on supply chain design and production output of selected sugar firms is not wholesomely conclusive and further analysis of other variables influencing the relationship is required on the way to adequately address effect of "supply chain" design on output of selected manufacturingfirms in Kenya, more investigation is needed. Exploration of intervening and moderating forces that reinforce or hinder the association between supply chain design and performance of selected sugar firms such as management style and level of technology, was recommended because it is obvious from the earlier studies it had gotten insufficient consideration by researchers.

Relative to earlier studies that employed only one measure of performance (Profitability), the current study investigated market share and cost reduction forming the financial and the non-financial indicators. The review of literature highlights several gaps shown below;

Table 2. 1: Research Gaps

Study	Focus of the study	Main findings	Knowledge gaps	Focus of current study
Carn and Lee (2015)	Effect of Cost and average inventory minimization in Kenyan manufacturing sector	The analysis shows that costsand inventories adversely affect Kenyan manufacturing sector with outcomes varying widely across industries.	At manufacturing level, the effect of cost and inventory was investigated. The study did not consider technological receptiveness to variations and design changes	The effect of cost reduction and inventory minimization was studied as well as the moderating effect of organizational factors on performance of selected sugar firms.
Attick and Ranjan (2017)	Effect of facility location and cost of operation in the Kenyan petroleum industry	Lack of proper decision approaches can adversely affect the operational cost of facility	The effect of facility location was investigated, the study did not capture the effect of Business relationships and need for better measurement instruments	The study focused on time wasted on searching for information, decision making approaches, planning that can affect the cost of operation and influence the overall cost of facility management.
Towill and Wilker (2008)	Effect of inventory reduction on profitability of sugar manufacturing sector in Kenya.	Use proper data management approaches and tools. Timely access to relevant data, quality control and quality assurance of field tasks.	Understanding the impact of both the operational elements of order fulfillment, provide knowledgeable service personnel.	Processes, input and structure without the consolidated framework that holds these aspects together. Keeping inventory at the bare minimum as a cost cutting technique.

Melynk (2018)	The study investigated the effect of organizational factors between "supply chain" design and performance	No exploration on the value of transitioning "supply chains"inthe dynamic set of influencers.	Robust, empirical, and analytical research that explicates role of influencers in "supply chain" design process.	High level undertakings as the business, political environment, the business model in use, the firm's expected outcomes and the "supply chain" life cycle.

Source: field data, 2022.

The linkage between"supply chain" design and performance has been extensively studied, but as shown in the table above, there are still knowledge gaps. The study brings out a number of data management issues including lost data, time spent searching for the right information, and a lack of interoperability. Poor planning and decision making can signigicantly increase cost of running business and maintaining a building. It is necessary to use appropriate data management strategies and tools to ensure timely access to relevant data for quality control and assurance of field tasks.

It is valuable to accurately assess business relationships, empasizing the largest gaps between current and required service occur not in traditional service areas, but rather in the softer elements contributing to bettering relationships, focusing on the ideal measurement instruments. The effect of order fulfilment, operational elements and provision of knowledgeable and sensitive service personnel, can assist in choosing between two seemingly related physical products.

Cabability of adjusting to various versions of a commodity, inadequate stock levelscan yield unnecessary duplication of efforts, resulting in a loss of output and the related

costs. Establish procedures, make investments, and build structures before establishing a foundation principle.

An important question is when certain design decisions should be triggered in the product's lifecycle. All of these elements and their interaction, is critical to comprehending and mastering the complexities and richness of "supply chain" design. Because solving the routing / travelling salesman problem is not always necessary, there is room for positive adjustment in estimating LTL vehicle tours in facility location problems.

2.5 The Conceptual Framework

It's the diagrammatic presentation of variables in a study. It represents the researchers knowledge about the issue being investigated. How independent and dependent variables relate pertaining supply chain design and how it affects performance in the Kenyan sugar industry as outlined on the diagram below:

Supply chain design   **Performance**

| Facility location |

Ho$_1$

| Territory optimization.
Increased market share
Cost reduction
Profit maximization |

| Operation assessment |

Ho$_2$

| Inventory reduction |

Ho$_3$ HO$_4$

| Organizational factors

Management Style
Level of technology |
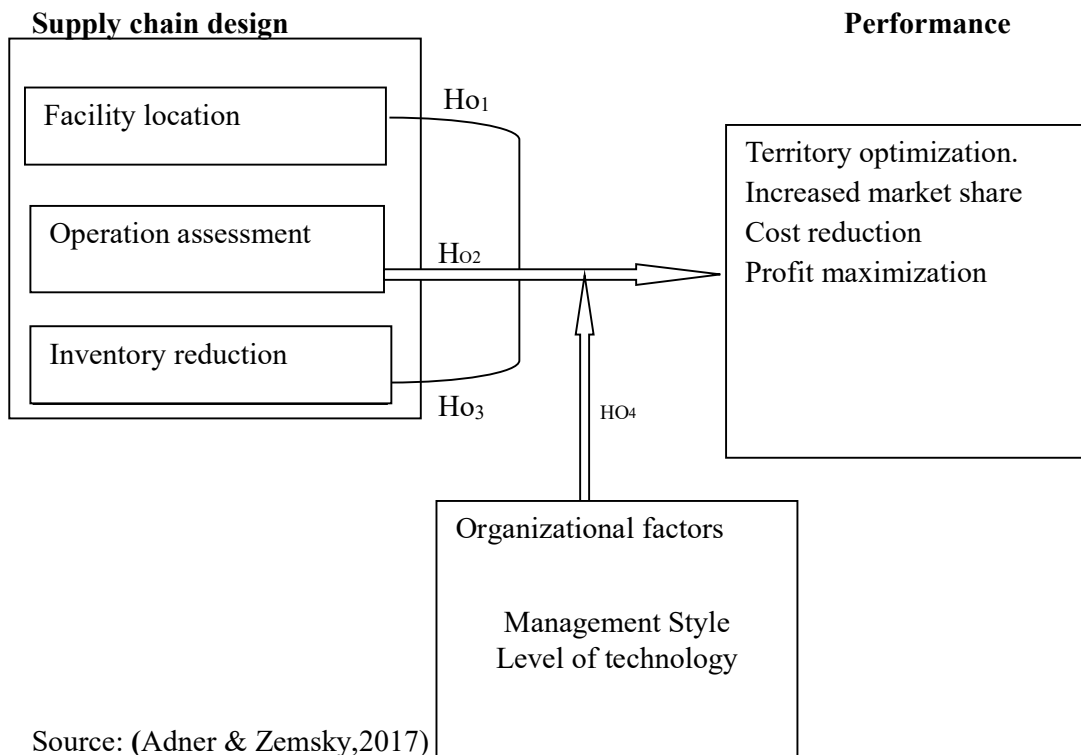
Source: **(**Adner & Zemsky,2017)

Figure 2. 1: The conceptual framework

Figure 2.1 above shows three areas (Independent Variables) which the researcher intended to establish effects on firms performance subject to supply chain design. The study determined: the impact of facility location onperformance, effect of operationsassessment on operational costs relating to performance and effect of inventory reduction on profitability in terms of units of production exhibited by the firm, (Adner & Zemsky, 2017).

The discussion, highlights value of facility location decisions in "supply chain". By revisiting classical models and develop a summary on more recent research targeting to expand the concept of location decisions to include extra features of " supply chain". It critically examines routes, management of inventory, robustness and reliability, (Al – Sultan, AL-Fawzan, 2019).

Risks and monetary losses can occur in today's globally dispersed supply chains. Optimized warehousing and storage are for lowering operational costs. It also means that you dont have to hire your own employees, (Simchi-Levi, 2003). Designing for high velocity movement will also help with obsolescence risk. Configuring for customization at the end of the product finish line will minimize risk by increasing flexibility. Finally, product design techniques should configure product components for re-use into the next product transition in the event that obsolescence does occur, (Ozsen & Coullard, 2013).

Organizational performance is the organizational results as measured against intended output, or goals. It includes financial output and shareholder returns. Performance is measured as financial returns (profitability), customer satisfaction (market share), social responsibility, employee stewardship, Porte (1996). Some factors are measured by human economic factors, (Scott 2000). The organization gets effectiveness, efficiency, and customer satisfaction outcomes with these resources.

Organizations are interdependent in that they seek resources including monetary and physical resources, technology, management skills, marketing expertise, information and sociol legitimacy among others. Through such interdependence, organizations can combine their resource sets synergistically with complimentary resources of partners thereby creating bundles that are unique and difficult to replicate, (Harrison, Hitt, Hoskisson & Ireland, 2001). In regards to the sugar manufacturing firms, the theory is critical in clarifying how the business environment affects the capacity of organizations to gain needed resources.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter discusses study methodology. The first section describe type of study, data collection procedures, processing, analysis, ethical considerations, framework validation as well as a discussion on the statistical tools.The chapter was based upon studies of the "supply chain," its design and effects onperformance of state-owned sugar firms. It broadly discussed the overall study design, data collection and analysis activities.

3.2 Research Design

The research used descriptive and correlational design to achieve stated objectives. The design was chosen in the study on "supply chain" design, in order to describe behaviour, attitudes, opinions, values, perceptions and characteristics as accurately as possible regarding peoples perception on supply chain design approaches and the socio technical factors involved, determine the degree of existence and discover the link that exists between them.This research was designed in state owned sugar industries in order to construct a frame work for its adoption to improve on supply chain design quality.

The study used both descriptive methods of means, percentages, standard deviations and frequencies to achieve its objectives,(Connor, 2011). This study brought an understanding on how "supply chain" design impact performance of state-owned sugar firms in Kenya.

3.3 Area of Study

The coverage was the four operating state-owned sugar firms of Western and Nyanza regions namely, Nzoia, Chemelil, Sony and Muhoroni Sugar companies Ltd.The geographical distribution was a fair representation of other sugar manufacturing firms due to population under study.

3.4 Target Population

The research was carried out on all four selected sugar firms in Kenya, (Chemelil, Muhoroni, Sony & Nzoia), and are currently operational, (Sugar industry was purposively chosen in the study since the firms have faced amyriad of setbacks in the past to the extent of having some firms close, necessitating the study). Target population constituted all factory managers (4), Finance managers (4), Agriculture Extension Officers (524), Human Resource managers (4) Agriculture services Personnel (180) Strategy and planning Managers, (4) yielding the total target population of 720 from the four sugar firms.

These were a true representation of their organization as their day to day duties cover the entire aspects of the questionnaire and involvement of more managers would be expensive but just yield similar responses. In their absence; their deputies were requested to fill the questionnaire.

Table 3. 1: Target Population

Sugar Company	Target Population	Agriculture Services Officers	Strategy Managers	Factory Managers	Finance Managers	Hr Managers	Totals
Nzoia	160	50	1	1	1	1	214
Chemilil	120	30	1	1	1	1	154
Sony	120	50	1	1	1	1	174
Muhoroni	124	50	1	1	1	1	178
TOTALS	524	180	4	4	4	4	720

Source, field data, 2022.

3.5 Sample Procedure and Sample

Severalformulas are available for calculating sample size. A probability proportion can be calculated using (Fisher's, 2003) formula for P value and use it to estimate the sample size.According to (Fisher,2003) P= (row sums)! Column sums(s)!/ (elements) n!Therefore, the chances of picking accessiblepopulation from the target.

P= 0.5346076

To calculate size required for estimation; a proportion of about 95% confidence interval,

$nr = 4pq/d^2$

where nr= required sample size

p= probability of the population, q= 1-p d= the level of precision.

If the proportion is not known, then p = 0.5 assuring maximum heterogeneity with a 50/50 split. The degree of precision (d) is acceptable margin of error.

Given the confidence level of 95%, then the margin of error is + 0.5%. Therefore,

nr =4(0.534607) (1-0.55346076)/(0.05)2=1.00/0.0025

nr =400

Using finite correction factor with the sample representing a significant value greater than 5% of the population,

 na = nr/ 1+ (nr-1)/N

400/(1+399+1719)=324.65

Therefore the finite size for the study is 325 respondents.

The study applied a (Fischer, 2003)

3.6 Sample Frame

It was drawn from target population in whicn every respondent had a high likelyhood of being chosen as shown below.

Table 3. 2: Sample frame and Questionnaire nos.

Sugar Company	Target Population	Agriculture Services Officers	Strategy Managers	Factory Managers	Finance Managers	Hr Managers	Totals
NZOIA	45	33	1	1	1	1	82
CHEMILIL	44	33	1	1	1	1	81
SONY	44	33	1	1	1	1	81
MUHORONI	44	33	1	1	1	1	81
TOTALS	177	132	4	4	4	4	325

Source, field data 2022.

The choice of four sugar factories was inevitable requiring atleast a sugar factory that has at least tried on implementation of the aspect of "supply chain" design.This was stratified and simple random sampling such that the intended and more appropriate responses were captured (Delbut, 2006).

The questionnaires were distributed in hard copy format sampled across the four sugar factories adding up to **325** respondents.This ensured that the research instruments functioned well and the questionnaire administered to respondents without any bias.This was probability sampling method.

3.7 Questionnaire

Itwas the main data collection instrument. It consisted of self-administered questionnaires. The instrument contained basic demographic questions and items intended to asses effects of facility location, operational assessment, inventory reduction and organizational factors on production output of sugar firms. The scale to asses 'performance" was developed by the researcher.Questions were prepared, validated and distributed to respondents. Questionnaires are the best choice for the larger target population.

Structured questionaires helped obtain data from respondents. It was composed of some closed ended structured items, (Mugenda & Mugenda, 2003). To succeed, questionnaires were short, simple and precise with questions moving from easy to difficult ones, (Kothari,2007). Questionnaires were handy having ability to collect sufficient information needed on the study concerning adoption framework within limited time and budget.

3.8 Sampling Design

The study used a stratified and simple random sampling since the 82 respondents from one firm plus 81 respondents from each of the three firms was attainable using this method. Sampling is used by the researcher to gather things to study, (Kombo, 2006). Senior to middle level managers were chosen since they were considered part of the entire management population and had the capacity to understand the question as the research issues. The results were used to draw conclusions about the whole population.

Table 3. 3: Return Rate

State Of Questionnaire	Number Of Questionnaires	Percentages
Retrieved	182	56.35
Not Retrieved	143	43.65
Total	325	100

Source: field data 2022.

3.9. Pilot Test

It was done to test reliability of questionnnnaires. According to (Sekaran,2003) the research perfectly and truthfully quantifies research results. Pilot study was hence done to establishflaws in design and instrumentation providing valid data for selection of a sample, (Cooper & Schindler, 2003).

The purposes of research were; (1) examine validity of the study, (2) determine clarity and value ofquestionnaire, (3) refine procedures for real survey, and (4) estimate time required in completing questionnaire and turnaround time.

It involved selecting 15 respondents, 3 from each of the three firms and 5 from one firm, then giving them questionnaires. Alpha coefficient of 0.79 indicated datagathered had high internal consistency and could be generalized to reflect opinions of all respondents in the target population.In this study, SPSS was applied to caluclate cronbach's alpha.

We showed the formula for standadized crownbach's alpha: $Ca=Nc/V + (N-I0)/c$, Where N is the number of items, c- is the average inter item covariance among the items and V- isthe average variance. The rule of thumb for describing internal consistency using cranbach's alpha is as below,(Kaufman and Kaufman, 2005) The coefficient

34

results of two sets had negligible difference with one set giving value of 0.79 and the other set a value of 0.8144 which ascertained the reliability of instruments.

3.10 Reliability of Research Instruments

This section covered reliability and validity of instruments. It helped determine if parameters appliedon same individuals from divergent firms yielded equivalent results, if results comparing with other studies yielded same results, and offered set of divergent operational definities of similar concept applied to similar individuals, using familardata collecting technique giving highly correlated result from other factories? Or items of the measure are internally consistent? . It involved acceptable levels of validity and reliability of instruments.

Table 3. 4: Reliability Statistics

Variable	Number of items	Cronbachs Alpha	Comment
Facility location	8	.757	Reliable
Operation assessment	10	.845	Reliable
Inventory reduction	14	.844	Reliable
Moderator	6	.747	Reliable
Overall	38	.798	Reliable

Source: field data 2022.

Table 3.4 indicates the lowest coefficient was linked to facility location scale at .757 with the highest alpha being operation assessment, which was .845 and overall alpha was .798. the measurement scale was consistent and the findings showed the study variables were reliable as provided for by (Nunnaly,1978), (Murphy and

Davidscofer,1998), and (Sekaran and Bougie, 2013). For this research, acrownbach alpha of .70 or more is considered reliable.

3.11 Validity of Research Instruments

Questionnaires were designed to collect information from respondents as needed to measure, (Fraenklel & Wallen, 2009) posit that the instrument ought to be given to the entity that can be expected to render an intelligent deduction concerning adequacy of the instrument. The instrument is amended according to experts recommendations before being administered. For validation, the researcher consulted industry experts in supply chain design who gave intelligent deduction concerning adequacy of the instrument, face validity and the instruments were amended according to experts comments and recommendations before admnistration.

The experts thoroughly checked the representativeness of research instruments at face value. (Chant, Rajiv, & Paul, 2015), identified three genres of validity, namely: face, construct and content validity.When an indicator looks to be a reasonable measure of it's fundamental construct "on its face", its said to have face validity. The study measurement scales were thought to have face validity because they captured key issues in facility location, operation assesment and inventory reduction. Content validity of the scale was determined by scale items corresponding to content realm of the idea being measured. Content validity according to (Bollen, 1989), and as stated in (Drosty, 2011), was a subjective type of validity in which realm of the idea was made apparent and the expert decides whether measures wholly symbolize the domain.

3.12 Operationalization of variables

The operational definition of variables is discussed in this section. The research assessed the views of respondents on key questions regarding facility location, operation

assessment and inventory reduction onperformance of state- owned sugar firms. Specific responses were sought regarding facility location and performance. The variables of technology, infrastructure, inventory management, logistics were used to evaluate supply chain design. The variables are ope-rationalized using structured questions seeking specific answers on supply chain design. In total, 10 items developed from the literature were used to help evaluate the extend to which firms benefited from "supply chain" design.

The moderating variable, organizational factors was measured using two dimensions namely management style and level of technology were measured using four and three items respectively each developed from literature to measure manufacturing enterprise receptivity to technology change. A five point likert scale has distinct advantages based on short, easy to understand questions and allows for quick evaluation of unique view points,(Bollen, Vergauwn, & Schieders2005).

Firm's performance which was the dependent variable wasevaluated using one financial item, profitability and three other non financial items, (Territory optimization, market share and cost reduction)

3.13 Data Type
Data was gathered using closed ended questionnaires. There was adoption of Likert Five Point rating scale of 5,4,3,2 and 1, to capture responses in questionnaire. A typical five level likert item, for example, could be; 1) Strongly Disagree 2) Disagree 3) Neutral 4) Agree 5) Strongly Agree.

3.14 Data Analysis Techniques
The researcher sought to establish if the questionnaires were duly completed. Data on questionnaire was cleaned, coded, classified and summarized for analysis. The most

ideal model for analysis of data was the linear regression model. Statistical Package for Social Sciences (SPSS version 20) helped analyse data. It helped correct flaws that had gone undiscovered, and improve quality of the data utilized in investigation.

Use of statistics was invoked. Descriptive statistics helped in illustrating broad data and specific characteristics of the organization,(Kothari, 2014). The level, direction and signifigance of the relationship was determined using correlation analysis.Regression models were fitted to data to asses the relationship between variables, and the moderating effects, andhypothesis testing in examining if the outcomes were significant or not. Results were presented in tables, figures, charts and graphs. Descriptive analysis described population and objectives. Qualitative data was analyzed basing on the objectives of the study.

The data collected was subjected to qualitative analysis. Hypotheses was tested at 95% confidence interval. Simple regression analysis helped determine the strength and direction of relationship between study variables. Linear Regression Analysis equation used was:

Model

$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$ Where:

Y = the c Performance; value of depedent variables

X= Supply chain design (value of the independent variables X_1 ,X_2, X_3, X territoryoptimization,market share,profit maximization,inventory reduction)

a= the intercept of regression line on the Y (C) axis when X (x-axis) = 0

b= slope of regression line

with moderator, the **model** then becomes,

$$Y = a + b_1 X_1 M + b_2 X_{2\,M} + b_3 X_3 + e$$

e = the error term-random variation due to other unmeasured factors. The questionnaires were coded for statistical analysis. Data from the respondents was sorted out, edited, coded, classified according to categories and tabulated for analysis. Hypotheses were tested using F-test to prove or disapprove relationship between variables.

3.15 Ethical Consideration

The study observed ethics. The study considered confidentiality, privacy and informed consent of respondents. The researcher sought letters of authority for research from National Council of Research and the institution of learning. Ethical considerationsrequired informed consent by participants agreeing to the research before it commenced and were informed of the research content. The researcher handled all details of respondents with confidentiality and, endeavored to seek permission from the respondents and explain to them how information gathered would be important in the adoption of supply chain design in state owned sugar manufacturing firms to foster development.

The researcher explained purpose and value of study.No information deemed to be confidential to the respondent was collected. The approach implored respondents to volunteer with information without coercion.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The chapter examines report findings. Collected data was analyzed and presented using charts and frequency tables. The analysis was based on the relationship emanating from the variables under investigation. Specifically: investigations on facility location, inventory reduction and operations assessment on the four state owned sugar manufacturing firms of Kenya. It dealt with data analysis, interpretation and discussions. The study was guided with four objectives.

4.2 Preliminary Results

These were: To analyse effect of facility location on performance of selected sugar manufacturing firms in Kenya. The study was guided by four objectives as highlighted in the ensuing section.

4.2.1 Response Rate

Out of the three hundred and twenty five (325) questionnaires administered, one hundred and eighty two (182) returned the duly completed questionnaires and as such, were considered responsive instruments forming the basis for analysis.

Table 4. 1: Response Rate.

State Of Questionnaire	Number Of Questionnaires	Percentages
Retrieved	182	56.35
Not Retrieved	143	43.65
Total	325	100

Source, field data 2022

This represents 56.35 % response rate of the issued research instruments. This is fair response rate bearing in mind that some respondents work on shift and outreach centers which were geographically distributed widely leading to a despondence rate of 43.65 %. (Mugenda & Mugenda 2009), posit that a response rate of 50% is ideal for analysis and reporting hence this being 56 % return rate is adequate enough for conclusions to be drawn from the study.

4.3 Descriptive Findings

4.3.1 Demographic Data

This section presents data on gender, marital status, company working age bracket,education level, length of service and respondents cadre for the four companies.The findings with regard to gender are female, 124 and male 58. This is illustrated in Figure 4.1 below.
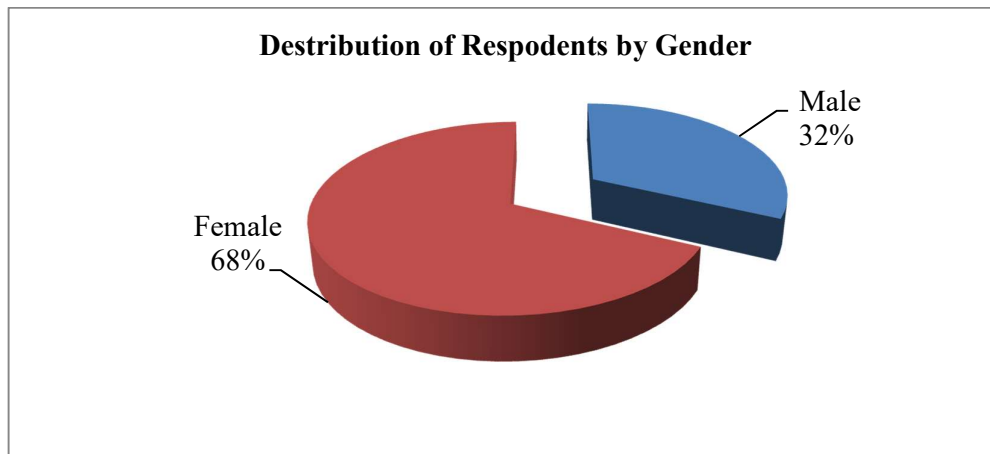
Figure 4. 1: Distribution of Respodents by Gender

Source, Researcher 2022.

The findings with regard to gender were as indicated in figure 4.2 above

4.3.2 Gender Response

From the Figure 4.1 above, it was observed that 68 % were female while 32 % male. The results indicated minority of the respondents being male. This meant that there were more women respondents that their their male counter parts.This implied that the special needs of the female gender were likely to be well articulated for; however,we note that this did not affect the overall principle of supply chain design in the state owned sugar industries as the response from male and females were alike.

4.3.3 Marital Status
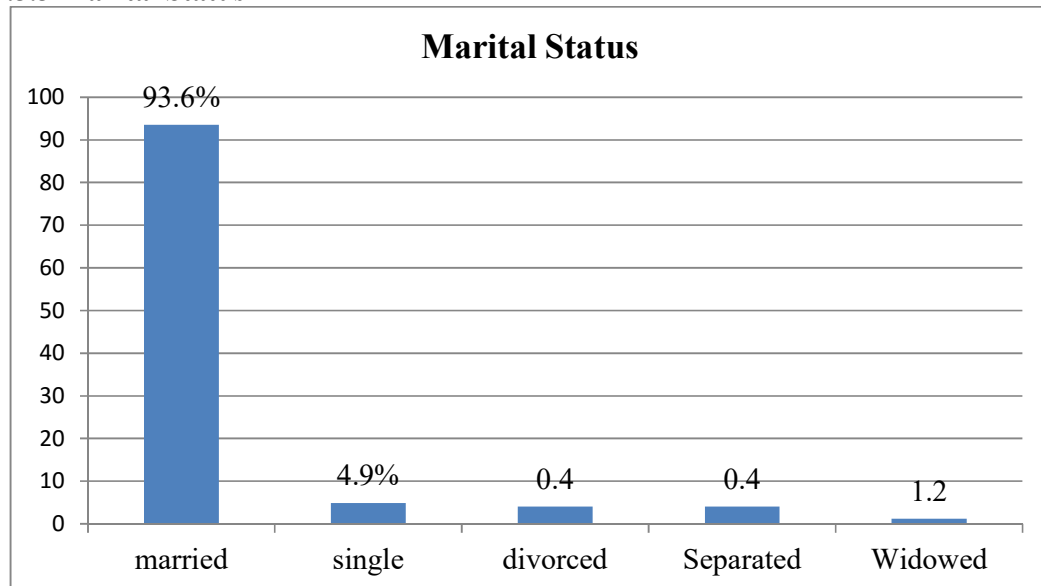
Figure 4. 2: Marital Status

Source, Researcher 2022.

From Figure 4.2 above above research findings indicated that 93% were married, 4.9% were single, 0.40 % were both divorced and separated while 1.2 % were widowed. This indicated majority of respondents being married giving a true reflection of the distribution of employees. This research required levels of maturity in respondents who portrayed a committed work force: married people are perceived to be mature and settled (Capelli 2010).

4.3.4 Age of the Respondents

Data from which respondents in the research was constituted as shown in fig 4.3 below
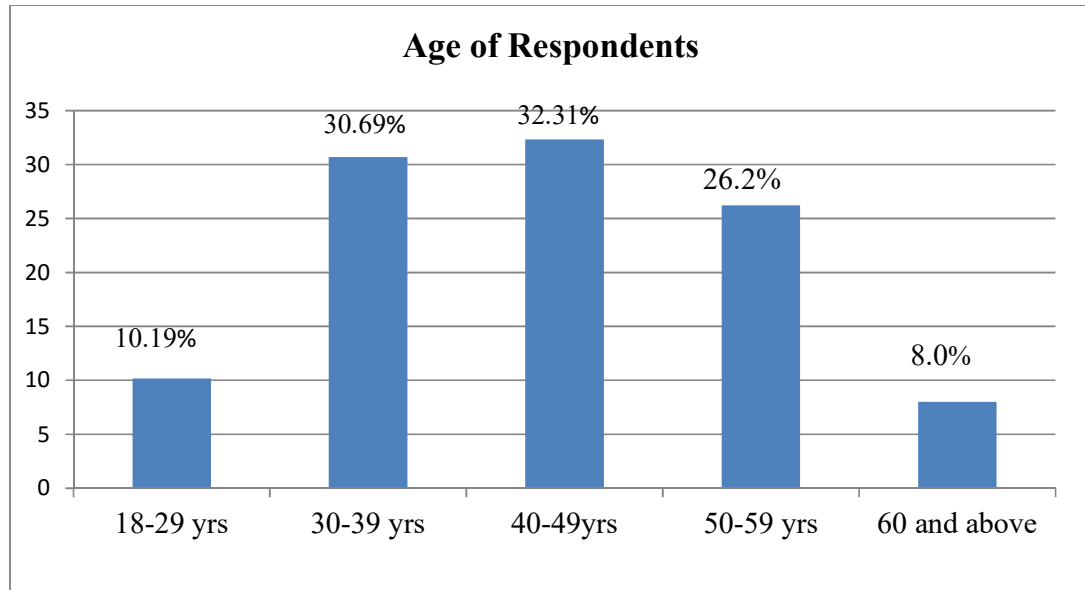
Figure 4. 3:Age of Respondents

Source, Researcher 2022.

From Figure 4.3 above, research findings showed that 10.19% (ages 18-29 years), 30.6% (ages 40-49 years) 32.3% (ages 40-49 years) 26.2 % (ages 50-59 years) and 8% ages of over 60 years.73% of respondents were of ages between 18 and 49 years. This age bracket is known to be more receptive towards innovation, technology acceptance and enhancement (Zaja 1999). This implied that their responses were bound to lead to development of frame work with high potential for adoption and acceptance of supply chain design in state owned sugar manufacturing firms in Kenya.

4.3.5 Level of Education

This was established as given below;
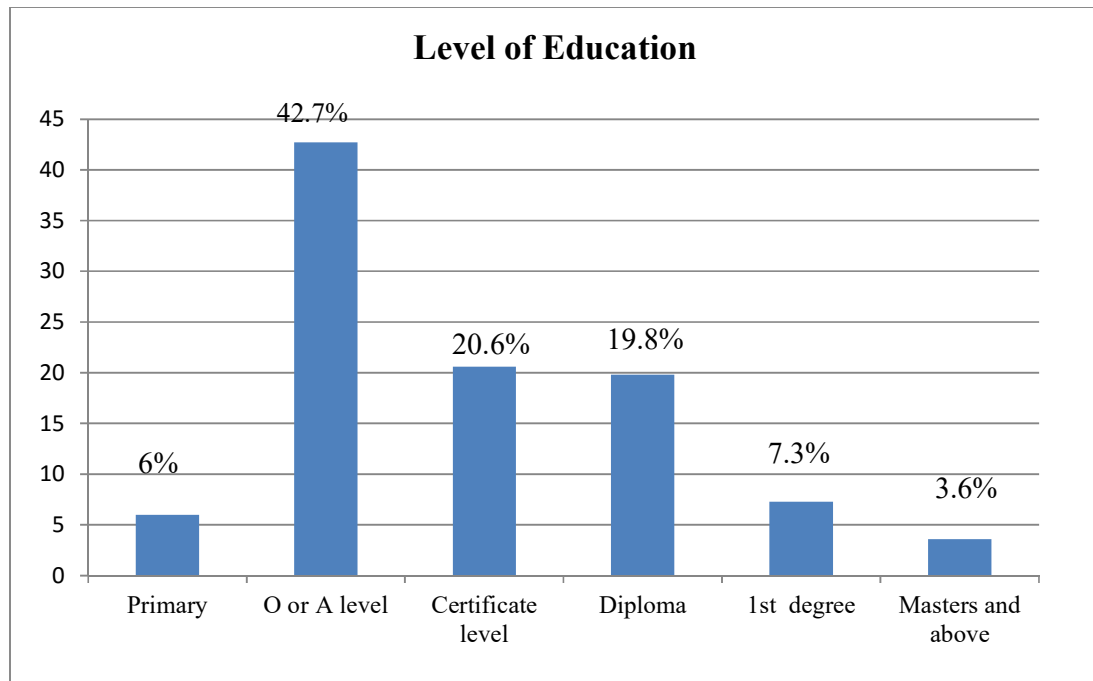
Source, field data 2022.

Figure 4. 4: Level of Education

From Figure 4.4 above, the researcher found that most of respondents had "O" level as highest level of education with 42.7%, followed by certificate and diploma levels at 20.5 % and 19.8 % respectively. First degree level had 7.3%, Masters level holders were the least at 1.6 %. Combined with interview, it was realized that most employees join organizations with "O" level qualification as a corporate social responsibility of creating employment.

This level of education coupled with working experience was sufficient enough to have quality knowledge, understanding and skills on the concept of "supply chain" design as a key factor that could influence adoption considering the digital divide. According to (Zaja 1999), the respondents appeared learnable and capable of adopting to new ideas, technologies and innovations.

4.3.6 Level Of Experience

The length of service indicated hands on experience as sort by the stud. Responses from experienced people provided answers that indicated the true practice in the industry that were handy in guiding new ideas, innovations, and technologies in the industry. They provided expert responses. The findings were as given in the figure 4.5 below:

The findings of the research were classified by objectives as specified earlier in chapter one section 1.4. It provides information on how the research objectives were achieved.

4.3.6 Level of Experience
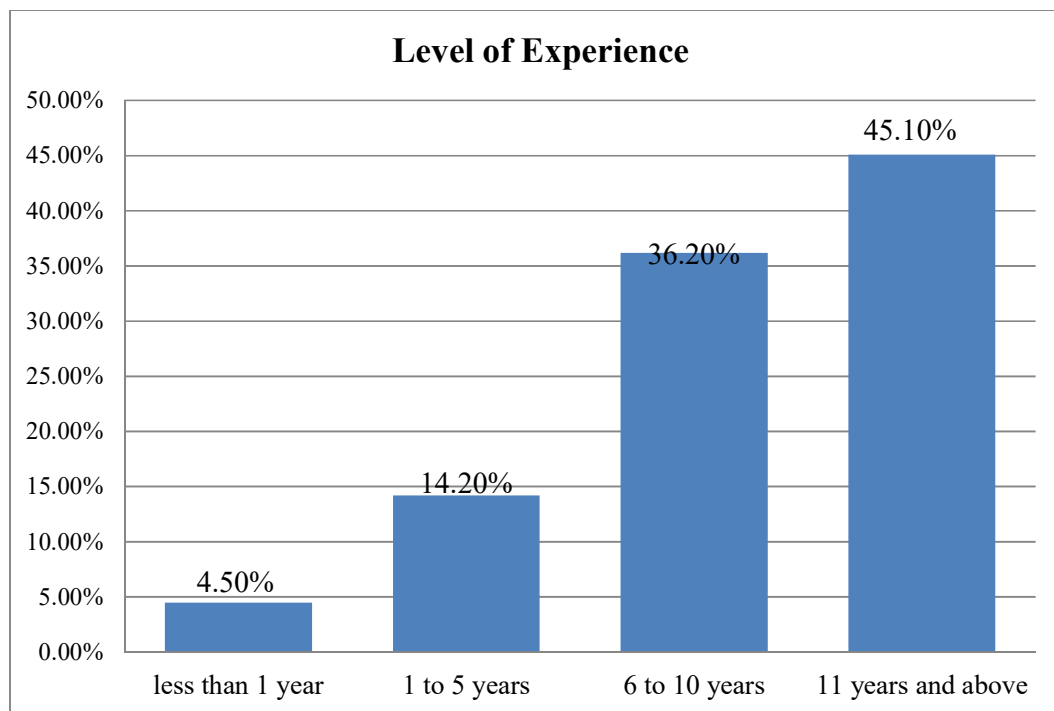
Source, field data, 2022.

Figure 4. 5: Level of Experience

4.4 Effect Of Facility Location On Perfomance

An analysis was done on effect of facility location onperformance. The analysis focused

on various areas of facility location that have effect on organizational performance.

Table 4. 2: Percentages on Facility Location and Perfomance

Facility location and performance	Disagree (% &f)	Agree (% &f)	Neutral (% &f)	Totals
Improved performance after maximum utilization of cane yard space	25.80(47)	74.18(135)	0.02	100% (182)
Increased performance after automation of ware house and weighbridges	12.64(23)	87.36(159)	0.00	100% (182)
Improved performance after efficiency and streamlining of processes in ware house and weighbridge	6.59(12)	93.41(170)	0.00	100% (182)
Increased performance as a result of low carrying costs, (quick build to shop times).	8.79(16)	91.21(166)	0.00	100% (182)
Increased performance due to low obsolescence costs (short lead times) i.e fast flow of raw materials from out growers to the processing facility.	11.54(21)	88.46(161)	0.00	100% (182)
There is streamlined structure of bill of materials to enable fast and accurate communication of needs to manufacturing.	82.97(151)	11.54(21)	5.49(10)	100% (182)
There was a lot of savings on the cost of transport due to full truck load technique, FTL	2.10(4)	97.90(178)	0.00	100% (182)
There was improved performance after adoption of mobile field weighbridges.	12.64(23)	68.68(125)	18.68(34)	100% (182)

Source; field data, 2022.

According to study in table. 4.3. above, it showed 135 respondents conforming to the

statement that performance improved after cost of occupancy reduced. The 159

respondents involved in the study acknowledged to the statement that performance improved after lowering value of relative cost. Results revealed that 170 respondents agreed that improved production was realized on identifying saving opportunities. There was a lot of savings on the cost of transport after FTL hence increasing performance. This had a direct bearing on the speedy flow of raw materials to the processing facility from the out growers as a result boosting performance.

4.5 Effect of Operation Assessment on Performance

An analysis was done on the effect of Operation Assessment on performance. The analysis focused on various areas of Operation Assessment that have effect on organizational performance.

Table 4. 3: Percentages on Operation Assessment and Performance from Respondents

Statements	Disagree (% &f)	Agree (% &f)	Neutral (% &f)	Totals
There is minimization of production damages.	8.79(16)	88.46(161)	2.75(5)	100% (182)
There is minimization of packaging costs.	6.59(12)	93.41(170)	0.00	100% (182)
There is tracking of inventory of raw materials and finished goods at all times.	15.38(28)	65.38(119)	19.23(35)	100% (182)
There is strong software for tracking of raw materials and products movement.	1.10(2)	76.92(140)	21.98(40)	100% (182)
There is powerful forecasting software to take care of peaks, offpeaks in shopping and transportation.	34.62(63)	54.40(99)	10.99(20)	100% (182)
There is streamlining of product and inventory management in the supply chain.	3.60(7)	79.66(145)	16.74(30)	100% (182)

There are repetitive activities in inspection of harvested materials and finished goods in warehouse.	2.10(4)	97.90(178)	0.00	100% (182)
Theres cost postponement of ceasing to invest in supply chain personnel and technology.	12.64(23)	68.68(125)	18.68(34)	100% (182)
There is configuration for customization at the end of the product finish line rather than at product initiation stage.	12.64(23)	87.36(159)	0.00	100% (182)
Theres design of roads, bridges, and culverts that link field facilities to manufacturing plant that aid in cost minimization.	3.60(7)	79.66(145)	16.74(31)	100% (182)

Source : Researcher, 2022

From table 4.4 above, results of study indicated 161 respondents showing that there was elimination of non-value adding activities. 170 respondents agreed that there's general improvement on business practices having a direct effect on the improvement of the quality service delivery and output as agreed upon by 119 respondents.

Raw material, process and product were easily checked and improved as confirmed by 145, 178 and 125 respondents respectively. The results obtained from the findings indicated that operational assessment enabled the company improve on performance in almost all functional areas, (Pajk., Indihar Stemberger, Kovacic, 2010) shared similar views that operational management systems require constant change and adaptation to merge the constantly changing business needs.

Table 4. 4:Percentages on Inventory Reduction and Perfomance.

Statements	Disagree (% &*f*)	Agree (% &*f*)	Neutral (% &*f*)	Totals
There is saving of energy costs in the warehouse	13.2(24)	78.4(143)	8.4(15)	100% (182)
There is ease of special order entry and manufacturing ie high level harvesting flexibility.	16.6(30)	78.9(144)	4.5(8)	100% (182)
There is general reduction in cost due to proper inventory	22.6(41)	68.4(124)	9.0(17)	100% (182)
The of bill of materials usually leverage capability of the order management system	21.8(40)	68.9(125)	9.3(17)	100% (182)
Warehouse inventory is usually maintained at the bare minimum to cut costs.	1.3(2)	98.7(180)	0.00	100% (182)
There is redundancy of machines or operations due to shortages of raw material inventory	4.1(7)	90.5(165)	5.40(10)	100% (182)
Theres storage of finished goods at appropriate distribution points close to customers.	12(23)	83.4(152)	4.6(7)	100% (182)
Theres keeping of organizations farm inputs at outreach offices for ease access to customers.	16.9(31)	75.6(138)	7.5(13)	100% (182)
Theres matching of supply as closely as possible with demand	21.8	68.9	9.3	100%
Theres use of information Technology in tracking of inventory both at the field, warehouse and at distribution centers	22.6	68.4	9.0	100%
Theres reliance on dependable high quality suppliers	16.6	78.9	4.5	100%
Theres strive to establish and keep long term relationship with suppliers	13.2	78.4	8.4	100%

Theres use of extension field staff to offer extension services to customers in order to improve raw material quality	16.9	75.6	7.5	100%
There is continuous improvement programs constantly dissipated to customers as continuous quality improvement strategy & customer retention.	12	83.4	4.6	100%
Information sharing between organizations and partners is accurate, complete, ideal and reliable for customers.	22.6	68.4	9.0	100%

Source; field data , 2022

4.6 Effects of Inventory Reduction on Performance

The results of the study above revealed 143 respondents agreeing to the statement, there was reduction in paper work initially associated with a lot of inventory. Analysis also indicated that respondents agreed to the statement that there was increased pace at which information flew within functional areas of the company with 144 respondents. There was generally an increase in profit maximization as the company moved towards JIT.

There was a shift of focus towards customer satisfaction, reduction in customer complain, reduced volume of documentation, ease of access to information, and a general improvement on company competitiveness (as depicted by frequencies of 165, 152, 138, 124 and 125) respectively. According to analysis in table 4.9, they demonstrated that inventory reduction improved performance of the fucntional areas in the firms in line with (Lis and Lin, 2006) .

4.7. The Moderating effect of organizational factors on performance

Table 4. 5: Percentages on moderating effect of organizational factors on relationship between supply chain design and perfomance of state-owned sugar firms in kenya.

Statements	Disagree (% &f)	Agree (% &f)	Neutral (% &f)	Totals
Good Management styles applied to facility location, operational assessment and inventory reduction will not have a positive effect on territory optimization	13.2(24)	78.4(143)	8.4(15)	100% (182)
Good Management styles applied to facility location, operational assessment and inventory reduction will not have a positive effect on cost reduction	16.6(30)	78.9(144)	4.5(8)	100% (182)
Good management styles applied to facility location, operational assessment and inventory reduction will not have a positive effect on profit maximization	68.4(124)	22.6(41)	9.0(17)	100% (182)
Modern and appropriate technology adopted in facility location, operational assessment and inventory reduction will not have a positive effect on cost reduction	68.9(125)	21.8 (40)	9.3(17)	100% (182)
Modern and appropriate technology adopted in facility location, operational assessment and inventory reduction will not have a positive effect on market share	98.7(180)	1.3(2)	0.00	100% (182)
Modern and appropriate technology adopted in facility location, operational assessment and inventory reduction will not have a positive effect on territory optimization	90.5(165)	4.1(7)	5.40(10)	100% (182)

Source: field data, 2022.

Results of the study in Table 4.8 above revealed 143 respondents agreeing to the statement that good management style applied to facility location,operation assessment and inventory reduction have a positive effect on territory optimization which translates in profit maximization. Analysis also indicated that good management styles applied to facility location, operation assessment and inventory reduction have a positive effect on cost reduction as agreed upon by 78.9% of respondents.

From table 4.8 above, 68.9% of the respondents disagree with the statement that modern and appropriate technology adopted in facility location, operation assessment and inventory reduction will not have positive effect on cost reduction hence indicating that this has asignificant positive effect on organizational performance. Similarly, 98.7% of respondents disagree with statement that modern and appropriate technology adopted in facility location, operation assessment and inventory reduction will not have a positive impact on cost reduction. 90.5% of respondents disagreed with statement that modern and appropriate technology adopted in facility location, operation assessment and inventory reduction will not have a positive impact on territory optimization.

4.8 Preperation and screening of Data

Examining or categorizing data, validating it for accuracy, feeding it into a computer, changing it, creating a database structure, integrating the many metrics are all part of data preparation, (Odon, Leslier & Robin, 2002). The details are outlined in the ensuing section.

4.8. 1 Diagnostic Tests

To proceed with regression analysis, the below regression models had to be examined for adequacy. The model has minimum thresholds, including, normality, multicollinearity,

and heteroscedasticity, (Brooks, 2008). The results of these tests are presented in the proceeding section.

4.8.2. Normality Tests

It was used to asses if data tallies a normal distribution. Variables exhibiting any realistic deviations from normality can change relationships. (McCabe, Moore & Craig, 2014), submitted normalcy test as being critical in determining if data was appropriately described. Normalcy was examined using histograms and the "Kolmogorov-Sminov" normality test. Normal distribution was an important precondition for carrying out regression analysis. (Miot, (2017), observed that good and descent data for study is that which is normally dispersed.

A insignificant result of p ≥0.05 (at a 5% significant level) implies normal distribution. The sig. Value being .000 for each of SCD values. The variables of facility location and performance of the firm had a significant value of .024 and .001 correspondingly. This implies that SCD constructs, facility location and performance of manufacturing firm had violated the normality requirement. Operation assessment on the other hand, had a value of .002, which was significant at 5% level. This imply that the premise of normalcy was violated by operation assessment, which is typical in large samples (Pallant, 2005). As a result, i then used visual diagrams as shown below.

Table 4. 6: Normality Test

	"kolmogorov–smirnov			Shapiro– wilk		
	Statistic	Df	sig.	statistic	df	sig.
FL	273	75	0.00	0.770	75	0.00
OA	0.187	75	0.00	0.937	75	0.00
IR	0.176	75	0.00	0.88	75	0.00
PE	0.193	75	0.00	0.877	75	0.00
BE	0.065	75	0.20	0.973	75	0.09
FP	0.12	75	0.02	0.968	75	0.00

Source, field data 2022.

Data was further examined for normalcy using histograms. The results were presented graphically as outlined in the figures 4.6 to 4.9 in the ensuing section.

4.8.3 Facility Location

Fig 4.6 below shows a symmetrical histogram, indicating facility location was normaly distributed. Exactly, the variable tabulated normal distribution with mean of 2.47 and .322 as the standard deviation hence bringing to conclusion that facility location model conformed to normality condition. Results are shown in the figure below;

Table 4. 7: Data on Facility Location

Facility Location	0	5	4	5	15	8	23	13	8	8	5	4	3
Frequency	0	0.2	1.25	1.5	2.5	3	3	3	2.5	2	3.0	1.25	0.75
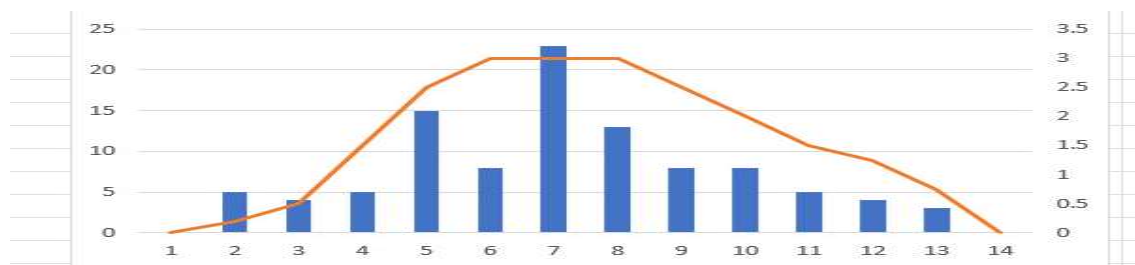
Figure 4. 6:Facility location

Source; Field data 2022

4.8.4 Operation Assessment

Fig 4.6 is an asymmetrical histogram indicating that operation assesment depicted a normal distribution. Operation assessment as a variable exhibited responses whose distribution was normal, with a mean equal to 0.81 (SD=0.507). Operation assessment variable hence fulfilled the normalcy pre condition.

Table 4. 8: Data on Operation Assesment

Operation Assessment	0	5	4	5	15	8	23	23	16	8	5	4	3	0
Frequency	0	0.07	0.17	0.5	0.8	1	1	1	0.8	0.7	0.5	0.42	0.25	0
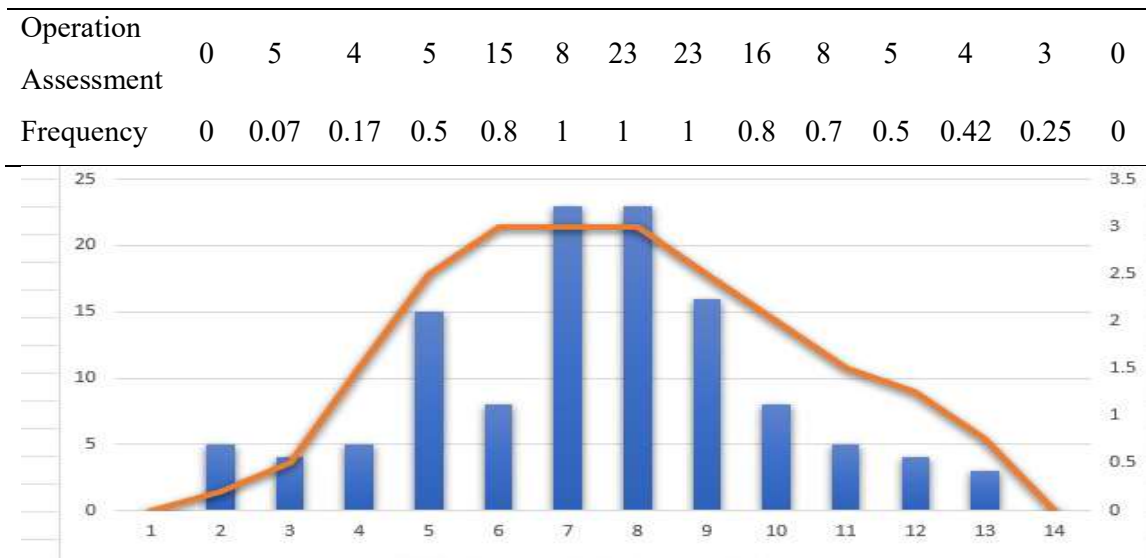
Figure 4. 7: Operation Assessment

Source, Field data, 2022

4.8.5 Inventory Reduction

The inventory reduction variable was examined for normalcy using a histogram and the outcomes are tabulated in fig 4.8 below;

Table 4. 9: Data on Inventory Reduction

Inventory Reduction	0	5	4	5	15	8	29	22	8	5	4	3	0
Frequency	0	0.2	0.58	1.5	2.5	3	3	2.5	2	1.5	1.3	0.75	0
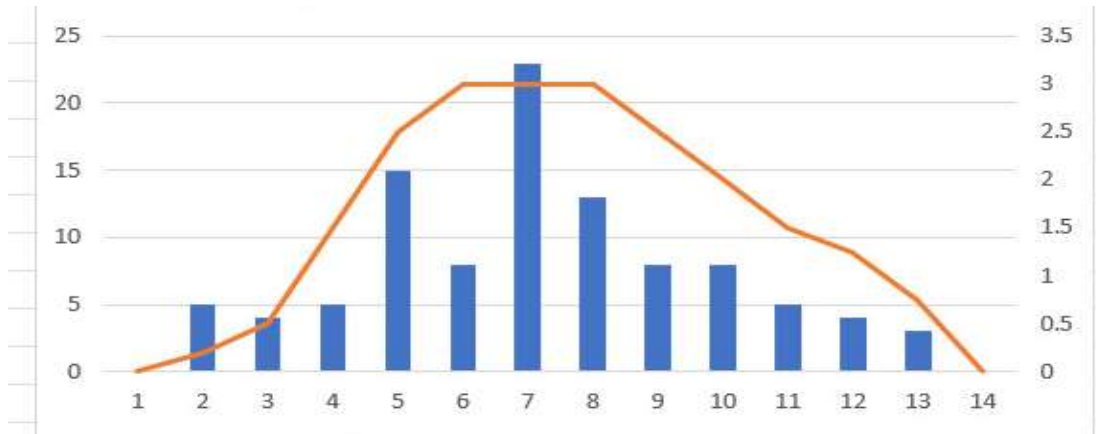
Figure 4. 8: Histogram on inventory reduction

Source, field data, 2022

From fig 4.8 above, inventory reduction variable exhibited responses that upon interogating for normalcy showed normal distribution with a mean equal to 2.80 (SD=0.710). Hence, bringing to a conclusion normality precondition of the evaluation was intact, as such, it was fine to proceed with regression analysis.

4.8.6 Performance of the manufacturing firm

Performance of manufacturing firm variable was examined for normalcy by way of a histogram and the outcomes tabulated below,

Table 4. 10: Data on perfomance of the manufucturing firm

Performance of Firms	0	5	4	5	15	8	23	13	8	5	4	3	0
Frequency	0	0.2	0.59	1.5	2.5	3	3	3	2	1.5	1.25	0.75	0
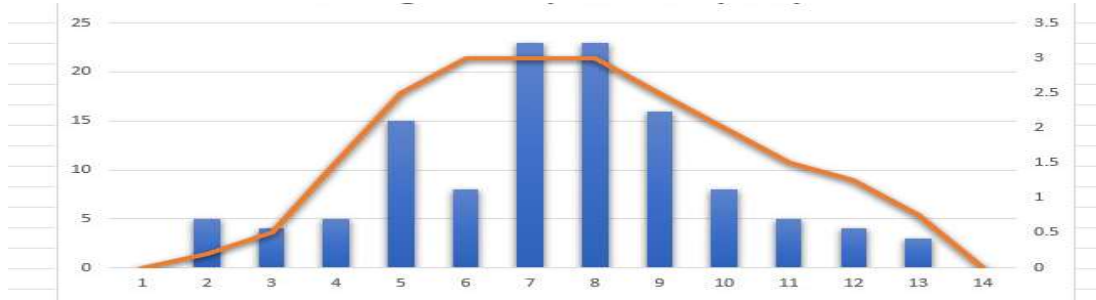
Figure 4. 9: Histogram on manufacturing performance

Source, field data, 2022.

Fig 4.9 above is an asymmetrical histogram showing the independent variable performance of manufacturing exhibiting a normal distribution. Performance of the manufacturing firms; a dependent variable showed responses and on examining for normalcy exhibited normal distribution with a mean equal to 2.79 (SD=0.54). Reliably, this is sufficiently evident to conclude that data complied with normalcy.

Multicollinearity happens when explanatory variables show high level of correlations, (Mugenda & Mugenda, 2003, Zhang & Ibrahim, 2005, Zientek, Kim & Amanda, 2016). The precondition, political environmental factor (PEF) test was invoked. The test, showed A PEF value exceeding 10 conforming to multicollinearity, (Hair, 2008). The outcome of the test is displayed below;

Table 4. 11:Multicollinearity Test

Variable	Tolerance	VIF
Facility location	.985	1.017
Operation assessment	.989	1.013
Inventory reduction	.987	1.015

Dependent Variable; Performance of manufacturing firm

Source; field data, 2022

Table 4.11 indicates three variables of interest, the PEF ranged from 1.013 to 1.017. The values ranges are indicative of the absence of mulicollinearity. Summarilly, tolerance

values ranged from 0.985 to 0.989 indicating conformity to the precondition. This demonstrates that regression analysis can be performed on data.

4.9.Homogeneity Test

A homoscedacity test is carried out to evaluate if divergent values of responses have similar variations independent of predictor variable. The supposition of homoscedasticity affirms the deviation of errors around regression line being constant for all variables, (Tabachnick and Fidel, 2013), and that remaining balances rectangularly distributed about anticipated dependent variable, concentrating near the centre, (Pallant, 2005). Levene test assesed the prior condition. It showed in null hypothesis lack of equality in variance of two populations, is real, (Hair, 2008). It was grounded on a 5% significant level. Table 4.11 below shows results;

Table 4. 12:Levene test statistics

Variable	Levene statistic	df_1	df_2	Sig.
Facility Location	2.734	12	58	.0039
Operation Assessment	2.511	12	58	.038
Inventory Reduction	2.488	12	58	.012

Source; field data 2022

Levenes test for the three variables of facility location, operation assessment, and inventory reduction was significant, according to Table 4.12. The coefficients for facility location, operation assessment and inventory reduction had significance of 0.0039, 0.38 and 0.012 respectively. The levene test statistics for the three constructs were significant as they were less than 0.005 and therefore we dont reject the three null hypotheses. This simply implies that the variances for facility location, operation assessment and inventory reduction were not significantly different, meaning that the homogeneity of the variance supposition was not broken. This makes data suitable for regression analysis.

The Correlation between facility location and perfomance was positive and significant (R=+0.540) with P=0.000

4.10 Simple Linear Regression Analysis

This tested direct effect of independent variables (facility location, operation assesment and inventory reduction) on dependent variable (supply chain design)

4.10.1 Simple Linear Regression Results on facility location

Simple linear regression analysis was conducted to establish the link between facility location and production output of selected sugar firms in Kenya. R square was used to establish contribution of facility location on performance of state owned sugar firms in Kenya as shown in the table below. The Correlation between facility location and perfomance was positive and significant (R=+0.540) with P=0.000

Table 4. 13: Simple Linear Regression Results on Facility Location

Model Summary								
		R	Adj R	Std.er of estim	Change statistics			
Model	R	Square	square		Rsq Change	F Change	Df1	Df2	Sig f change
1	.504[a]	0.266	0.256	0.615	0.266	26.759	1	74	0

ANOVA					
Model	Squares Sum	Df	Square Mean	F	Sig
Regression	10.124	1	10.124	26.759	0.001[b]
Residual	27.996	74	0.378		
Total	38.119	75			

Coefficients[a]					
	Unstd Coeff		Std Coeff Beta	T	Sig
Model	B	Std. Error			
Constant	1.344	0.406		3.311	0.001
Facility location	0.563	0.109	0.504	5.173	0.000

Source, field data, 2022.

Table 4.13 showed positive significant association between facility location and performance in supply chain design of selected state owned sugar firms in Kenya.

Facility location accounted for 26.6% (R^2=0.266) variations. The correlation between facility location and perfomance was positive and significant, (R= +0.504) and P value of 0.000. The F value was more than zero, F=.000, therefore facility location is a significant factor on production output of state-owned firms in Kenya. Facility location had linear, positive measurable (P<0.05) association with performance in state-owned sugar manufacturing firms {B=0.563, t=5.173, P=0.001}. Results are shown as a model below;

Model: $Y = \beta_o + \beta_a \dot{X}_a + \epsilon$

Where Y= Performance of state owned sugar firms,

β_o= 1.344 (constant)

β_i= 0.563

X_a= Facility Location

Replacing in the equation above : Y= 1.344 + .563X_a + e

The equation constant value is 1.344, P = 0.000, Facility location has regression value of .563 as the coefficient value. Every unit gain in facility location results in a proportionate gain that is significant in performance of state- owned sugar firms by 56.3%. This study agrees with (Onyango, Obrien and Ghodsypour, 2015) who studied the association between facility location and production output of cement manufacturing companies in Kenya.

The research is further in agreement with (Otieno & Getuno, 2017), on investigation of effect of supplier information shared regarding it to be positively significant to performance of state-owned secondary schools in Nairobi City, Kenya. The results further agree with the study by (Arrowsmith and Hartley, 2016) who established a positive significant linkage between facility location basically on performance. Similarly, it disagrees with (Kiarie 2017) who found that facility location implementation had

insignificant effect on general efficient output of huge manufacturing companies in Kenya.

4.10.2 Simple Linear Regression Analysis on Operation Assessment

Simple linear regression analysis shows effect of Operation Assessment on production output of selected sugar firms in Kenya.

Table 4. 14: Simple Linear Regression Results on Operation Assessment

Model	R	Rquare	Adj R Square	Std.ErOfEstim	Change Statistics				
					Rsq Change	F Change	Df1	Df2	Sig. F Change
1	.602[a]	0.375	0.367	0.567314	0.375	44.44	1	74	0

ANOVA [a]					
Model	Square Sum	Df	Square Mean	F	Sig.
Regression	14.303	1	14.303	44.4	0.000[b]
Residual	23.817	74	0.322		
Total	38.119	75			

Coefficients[a]					
	Unstdcoeff				
Model	B Error	Std. Error	Stdcoeff Beta	T	Sig
OA	0.735	0.407		1.806	0.075
	0.737	0.111	0.602	6.666	0

Source, field data 2022

From table 4.14 above, values showed significant positive relationship between operation assessment and performance of selected manufacturing firms in Kenya. Operation assessment accounted for 37.5% (R^2 =0.375).The Correlation between Operation Assesment and perfomance was positive and significant with (R=+0.602) and P value at 0.000. The F value was more than zero, F=44.440, P=.000, hence Operation Assessment was a significant predictor on production output of selected sugar firms in Kenya. Operation assessment had linear, positive realistic association to production output of selected sugar manufacturing firms in Kenya. ($P< 0.05$) { regression coefficient, B=0.737, and t=6.666}.

The model presents the findings;

$$Y = \text{ß}_o + \text{ßЬ}\dot{X}\text{Ь} + \text{€}$$

Where Y= Performance of selected sugar firms in Kenya

ß_o= 0.735 (constant)

ßЬ= 0.737

$\dot{X}$Ь= Operation Assessment

Y= 0.735 + 0.737$\dot{X}$Ь

From the model, the constant had coefficient of 0.735, P= .075. Its implication on Operation Assessment on State-owned sugar manufacturing firms would be positive at 0.735 hence insignificant (P>0.05). These results are in agreement with (Mungai, 2014) who realized that Operation Assessment had a positive significant influence on Kenyan real estate performance. Additionally, (Masiko, 2013) confirmed that operation assessment had a positive significant effect on Kenyan commercial banks and "supply chain" design. However, this finding contradicts (Tyndall, Gopal, Partsch and Kamauff, 2016), who found operation assessment to be of insignificant influence on perfomance in Table 4.7 Correlation Coefficients Analysis on process renovation and operational performance process renovation operational performance process renovation 1.0000 0.6700 operational performance 0.6700 1.0000 43 Source: Researcher Owner (2016) Cement Manufacturing firms in Kenya.

Table 4. 15: Simple Linear Regression Results on Inventory Reduction

Model	R	R square	adj R square	std.Er of Estim	change statistics				
					R sq change	F change	df1	df2	Sig. f change
1	0.508[a]	3.12	0.302	0.595451	0.312	33.511	1	74	0

a. Predictors (constant) inventory reduction

Model	Square Sum	ANOVA Df	square mean	F	Sig
Regression	11.882	1	11.882	33.511	0.01[b]
Residual	26.238	74	0.349		
Total	38.119	75			

a.Depent variable: supply chain design
b. Predictors: (constant), inventory reduction

	coefficients[a]				
	Unstdcoeff		Stdcoeff		
Model	Bstd.Error		Beta	T	Sig
OA	1.595	0.321		4.966	0
Inventory Reduction	0.506	0.087	0.508	5.789	0

Source, field data, 2022.

4.10.3 Simple Linear Regression Results on Inventory Reduction

The findings were that inventory reduction showed a linear, positive significant effect on production output of selected state-owned manufacturing firms in Kenya. Inventory reduction accounted for 31.2% (R^2=0.312) variations, The Correlation between inventory reduction and perfomance was positive and significant (R= +0,508) with P at 0.000. F value was more than zero, F= 33.511, P=.000, therefore, inventory reduction emerged significant measure on state-owned sugar manufacturing firms in Kenya.

The (P>0.05) as regression coefficient, (B=0.506), as t= {5.78}.

The model is hereby generated :

$Y = ß_o + ß_c \dot{X}_c + €$

Where Y= Performance of state owned-sugar manufacturing firms.

$ß_o$= 1.595(value that is constant)

$ß_c$ = 0.506

X_c = Inventory reduction

$Y = 1.595 + .506X_c + \epsilon$

The implication is that any extra unit of inventory reduction leads to an additional unit output in cost reduction, increasing profitability up by 50.6%. The findings agree with (Sreejith and Vinaya, 2017) who found inventory reduction to be positively affected by construction sector in kenya. It also agrees with (Rodeghier, 2017), who studied effect of "supply chain" design and manufacturing performance. The results were that inventory reduction tenets had a significant positive effect on production output.

4.10.4 Multiple Regression Analysis with moderator

Multivariate effect on Facility Location, Operation Assessment and inventory reduction in comparison to performance of state-owned sugar manufacturing firms was sought as illustrated in the below;

Table 4. 16: Multiple Regression Results with Moderator

					Summary model				
Model	R	R square	Adj R square	std.Er of Estim		change statistics			
					R sq change	F change	df1	df2	Sig. f change
1	0.81[a]	0.589	0.650	0.24480		133.603	4	71	0
2	0.893[b]	0.797	0.791	0.31632	0.140	7.893	4	71	0
3	0.901[a]	0.812	0.804	0.23693	0.015	7.893	4	71	0.006

				ANOVA[a]		
Model		square sum	Df	square mean	F	Sig
1	Regression	24.02	4	8.007	133.603	0
	Residual	6.113	71	0.06		
	Total	30.132	75			
2	Regression	24.463	4	6.116	108.948	0
	Residual	5.67	71	0.056		
	Total	30.132	75			
3	Regression	25.463	4	6.116	108.948	0
	Residual	4.67	71	0.056		
	Total	30.132	75			

Model		Unstdcoeff B	std.error	Std coeff Beta	T	Sig.
1	Constant	0.769	0.174		4.422	0.00
	facility location	0.358	0.602	0.273	5.746	0.00
	operation assessment	0.484	0.076	0.454	6.389	0.00
	inventory reduction	0.342	0.067	0.356	5.072	0.00
	Organizational Factors	0.341	0.066	0.354	5.07	0.00
2	Constant	0.108	0.354	0.236	0.305	0.01
	facility location	0.309	0.063	0.448	4.929	0.00
	operation assessment	0.478	0.073	0.508	6.924	0.00
	inventory reduction	0.488	0.084	0.501	5.847	0.00
	Organizational factors	0.499	0.082	0.187	5.801	0.00
3	Constant	0.486	0.354		0.305	0.01
	facility location	0.109	0.063	0.236	4.929	0.00
	operation assessment	0.308	0.073	0.448	5.504	0.00
	inventory reduction	0.571	0.083	0.508	5.846	0.00
	Organizational factors	0.489	0.172	0.501	4.801	0.00

Source, field data, 2022

From table 4.15, introducting of interaction terms moved R squared (R^2) from 0.657 for model 1 to 0.797 model 11 then from 0.797 to 0.812 model 111. The increase from 1 to 11 was 0.140 and11 to 111 was 0.015, Therefore, supply chain design moderation showed the moderator had significant positive effect though the increase went down as more variables came on board.

Further more, the state of facility location, operation assessment and inventory reduction remained significant even after running the moderator insinuating that supply chain design had significant positive effect on performance of state-owned sugar manufacturing firms in Kenya. We therefore reject null hypothesis.

The **model** then becomes;

$$Y = a + b_1X_1 M + b_2X_2 M + b_3X_3 + e$$

Where, Y= performance of state-owned sugar manufacturing firms in Kenya'

$$Y = 0.109 + 0.358M + 0.342M + 0.478M + e.$$

CHAPTER FIVE

RESEARCH SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This outlines the research findings, conclusions and recommendations. The study operated with four (4) hypotheses.

HO_1: Facility location has insignificant relationship with performance of state owned sugar firms in Kenya.

HO_2: Operation assessment has insignificant impact on performance of state owned sugar firms in Kenya.

HO_3: Inventory reduction has insignificant impact on performance of state owned sugar firms in Kenya.

HO_4: Organizational factors have insignificant influence on the relationship between supply chain design and performance of state owned sugar firms in Kenya.

5.2 Summary of the Research findings

5.2.1 Facility Location and Performance

The introductory objective was to examine effect of facility location on performance of state-owned sugar manufacturing firms in Kenya. To determine the objective, a hypothesis "HO_1: Facility Location has insignificant effect on performance of state-owned sugar manufacturing firms in Kenya" was set and tested, the hypothesis was rejected; We therefore conclude that facility location had positively and significantly affected performance of functional areas of state-owned sugar manufacturing firms in Kenya.

5.2.2 Operation Assessment and Performance

The second objective was to investigate effect of operational assessment on performance of state-owned sugar manufacturing firms in Kenya. To determine the objective, a hypothesis "H_{O2}; Operation Assessment has insignificant effect on performance of state owned-sugar manufacturing firms in Kenya was set and analyzed. The hypothesis was rejected. We hence concluded that operation assessment had positively and significantly affected performance of the selected state-owned sugar manufacturing firms in Kenya. Results indicated operational assessment enabled company's improving on performance in almost all functional areas. (Pajk., Indihar Stemberger, Kovacic, 2010), shared similar views that operational management systems require constant change and adaptation to overcome the constantly changing business needs.

5.2.3 Inventory Reduction and Performance

The third objective was to evaluate effect of inventory reduction on performance of state-owned sugar manufacturing firms in Kenya. To determine the objective, a hypothesis "H_{O3}; Inventory Reduction has insignificant effect on performance of state- owned sugar manufacturing firms in Kenya", was set and tested. The hypothesis was rejected; we hence concluded that inventory reduction had positively and significantly affected performance of the selected state-owned sugar manufacturing firms in Kenya.

5.2.4 The Moderating effect of Organizational Factors on the relationship between Supply Chain Design and Performance

The fourth objective of investigating relationship between supply chain design and production output in Kenya's state-owned sugar manufacturing firms, focusing on effect of organizational factors. To determine the objective, a hypothesis "H_{O4}; Organizational

factors have insignificant effect on relationship between supply chain design and performance of state-owned sugar manufacturing firms in Kenya". Was set and tested. The hypothesis was rejected. We therefore conclude that organizational factors had positively and significantly affected the relationship between supply chain design and performance of state-owned sugar manufacturing firms in Kenya.

5.3 Conclusion

Public and private companies to employ facility location strategies for sustainability and adopt operational assessment as continuous improvement process. The study recommends the regulator in sugar industry to avail a conducive environment that will boost technology innovations in sugar industry to gain the entire benefits of supply chain design. The study also recommends that sugar companies need to grow the customer base, sustain and build confidence of farmers for their business to grow further and also for them to invest more; they should embrace supply chain design. The results indicated general performance of the state owned sugar firms improve after implementation of supply chain design.

5.3.1. Conclusion for each

5.3.1.1 To establish effect of facility location on performance of state owned sugar firms in Kenya.

This demonstrated that time wasted in searching for information, lack of interoperability, lack of proper decision making approaches and lack of planning can squeeze the Operation cost and influence cost of facility management. Decisions on ideal location of facilities can determine the ultimate effect of cutting costs of operations, distribution and manufacturing hence determining enterprise profitability.

The problem of approximating LTL, vehicle tours in facility location problems without considering the cost of solving routing/ salesman problem remains an open challenge worthy of additional research.

5.3.1.2 To investigate effect of operational assessment on performance of state owned sugar firms inKenya

This highlighted the need for grasping effect of operational elements of order fulfillment and the necessity to avail knowledgeable and sensitive service personnel who understand the desires of customer base auguring well in differentiating a likely similar physical complete product. An increase in redundancy of machinery and operations resulting from inventory shortages causes production loss and the associated costs. The emphasis on processes, investments and the structure but the glue that holds it all together is glossed over.

5.3.1.3 To examine effect of inventory reduction on performance of state owned sugar firms in Kenya.

This showed that inventory reduction improved performance of the functional areas in the firms in line with (Lis and Lin, 2006) who found information sharing to be vital for any supply chain management organization to work efficiently in any firm.

5.3.1.4 To interrogate the moderating effect of organizational factors on the relationship between supply chain design and performance of state owned sugar firms in Kenya.

This brought out the fact that organizational factors had positively and significantly affectedthe relationship between supply chain design and performance of state-owned sugar manufacturing firms in Kenya.

5.4 Suggestions For Futher Research

A breakdown of gaps manifested in literature relating to the study is illustrated here. The study revealed gaps in management of data, data loss, time wastage in searching for information and lack of interoperability. Inadequate decision making approaches, poor planning can squeeze the operational cost upwards and influence facility management cost. There's need to use proper data management approaches and tools, ensure timely access to relevant data, ensure quality control and assurance of field tasks at all times in order to boost operational efficiency, production output and lead to realization of profits in the manufacturing enterprise, especially the sugar manufacturing sector.

REFERENCES

Adejuno, (2017)."Supply Chain Design and Perfomance of the Mananufucturing sector in Kenya", Core concepts, analytical tools and cases.

Arrowsmith and Haulley, (2016), "Facility location and perfomance in the kenyan Cement manufucturing sector"

Adner and Zemsky, (2017). "Diversification and Perfomance, Linking relatedness, Marketstructure and the decision to diversify" Adner working paper.

Arthur Thompson, (2004), "Strategy, Wining in the market place, core concepts analytical Tool and cases", New York: McGraw-Hill Irwin.

Al-sultan and Al-fawzan, (2019). "A Tabu Search Approach to the uncapacitated facilitylocation problem", Anals of operations research, 86, pp 91-103.

Averbakh and Berman, (2020). "Minimax regret median location on a network under uncertainity" new informs journal on computing, 12-2, pp 104-110.

Balicik, (2019). Multi-item integrated location/ inventory problem, M.s thesis, department of industrial engineering, Middle East Technical University.

Barahuma and Jensen, (2008). "Plant location with minimum inventory, mathematical programing, 83 pp 101-111.

Berger, (2019). "Location rooting models for distribution system dsign" Phd dissertation,

department of industrial engineering and management sciences, North Western University, evanston, il.

Berman, jaillet and simchi-levi, (2018). "Location routing problems with uncertainty, in facility location". A survey of application and methods, drezner springer new york.

Berman, and Karss, (2002). "Facility location problems with stochastic demands and congestion in facility location applications and theory"

Birge and Louvesux,(1997). Introduction to stochastic programming springer new york.

Bollen, L, Vergauwen, P and Schnieders, S. (2005). Linking intellectual capital and

    intellectual property to company perfomance. Journal of Management Decisions, 43(9), 1161-1185.

Burkhard and Donani, (2015). "Robust location problems with po/neg weight on a tree network" 38'2 pp 102-113.

Brooks and Wilson, (1993). Inventory Record Accuracy: Unleashing the Power of Cycle Counting . Essex Junction, VT: Oliver Wight, 1993.

Brooks, C., (2018). Univariatitime series modelling and forecasting. Introductory Econometrics for Finance, 2nd Edition, Cambridge University Press. Cambridge, Massachussetts.

Baron andKenny, (1986). The moderator-mediator variable distinction in socioPsychological research: conceptual, strategic, and stastical considerations. Journal of personality and socioal psychology,51 1173-1182.

Bell, (2018). Human Resource Development in the current phase of scientific and technological Advances: Questions for the future in the context of the past Paper prepared for the EC-ASEAN seminar on world structural change: the SEAN-EEC Link and Human Resource Development, Bangkok, Thailand.

Bobillo, Rodriguez Sanz and Gaite, (2006). Innovation Investment, Competitiveness, and perfomance in industrial firms, Thunderbird international Business Review, 48,6,867-890.

Capelli, (2010). Qualitative and Quantitative Research Methods.

Cooper and Schindler, (2014). Business Research Methods. New York Mc- Graw Hill Irvin.

Chary S.N, (2018). Production and Operations Management, Third Edition. Tata McGRAW-Hill Publishing Company Limited, New Delhi.

Chang, C.C, (2012). Exploiting IT entrepreneurs' dynamic capabilities using Q-technique. Industrial Management and Data systems, 112(8), pp 1201-1216

Chen and lin (2018). " Minimux-regret robust 1-mediun location on tree, network that1, 93-103.

Current, Ratick and Revele, (2019). " Dynamic facility location when the total number of facility is uncertain' a decision analysis approach" European journal of operational research, 110:3, pp 577-609.

Closs and molenkorff, (2014). " A global supply chain frame work" industrial marketing management 3 pp 37-44.

Cooper, lampert and pagh, (2018). " Supply chain management, more than a new name forlogistics" the international journal of logistics management 8 (II) 1-14.

Conea, (2019). Supply chain managment. implementation issues and research opportunities, the international journal logistics management 9 (2) 1-20.

Coltrain, (2019).Human Resource Development in the current phase of scientific and technological Advances. Questions for the future in the context of the past. Paper prepared for the EC-ASEAN seminar on world structural change: the SEAN-EEC Link and Human Resource Development, Bangkok, Thailand.

Cheng, (2012),.'Dynamic facility location when the total number of facility is uncertain' a decison analysis approach" European journal of operational research, 110:3, pp 577-609.

Chant, Rajiv and Paul, (2015). Innovation Investment, Competitiveness, and perfomance inindustrial firms, Thunderbird international Business Review, 48,6,867-890.

Cooper & Schindler, (2003)." supply chain management, more than a new name for

 logistics" the international journal of logistics management 8 (II) 1-14.

Daskin and jones, (2019). "A new approach to solving applied location problems," microcomputers in civil engineering, 8, pp 409-421.Drezner and Hamacher, eds, new york, pp 331-373.

Day, melink, lason, devis and whybark, (2012). " Humanitarian and disaster relief supply

chains: a matter of life and death" journal of supply chain management 48 (2) 21-36.Determining the future for Lovisiana Sugar Cane Products Inc: A case study of analysing vertical coordination options.

Dunning, J.H (2019). The globolization of business, London: Routledge, Location and theMulti-National Enterprise; Aneglected factor? Journal of international business studies.

Dorman, Elitt, Bacher, Bochman, Carl and Care, (2013).A new approach to solving applied location problems," micro computers in civil engineering, 8, pp 409-421.Drezner and Hamacher, eds, new york, pp 331-373.

Drosty, (2011).Innovation in cities; science-based diversity, specialization and localized competition, European Economic Review, vol 43, issue 2, pp 409-429.

Delbut, (2006).the interaction of location and inventory in designing distribution systems," IIE transactions 32, pp 155-166.

Daskin, (2019).Resource complimentarity in business combinations; Extending the logic to organizational alliances. journal of management , 27(6), pp 679-690.

Dunning andRugman, (1985). Supply chain managment: implementation issues and research opportunities, the international journal logistics management 9 (2) 1-20.

Edelman, L, and Yli-Renko, H (2010).The Impact Of Environment and Entrepreneurialperception on Venture-Creation Efforts; Bridging the discovery and creation views of entrepreneurship. Entreprenuership Theory and practice, 34(5), pp 833-856.

Eugenio Cavenaghi,(2014). Business Practices and innovations to respond to shifting tradefinance landscape, Supply chain finance: Get up to date with a rapidly evolving market, ICC Headquarters 33-43 Avenue dupresident Wilson 75116Paris, Summit France, 2014.

European Journal of Business and Management www.iiste.org ISSN 2222-1905(

Paper)ISSN 2222-2839 (Online) Vol. 6, No. 19, 2014 180.

Erlebacher and meller, (2000). "The interaction of location and inventory in designingdistribution systems," IIE transactions 32, pp 155-166.

Feldman, M.P, and Audretsch. D. (1999). Innovation in cities; science-based diversity, specialization and localized competition, European Economic Review, vol 43, issue 2, pp 409-429.

Feiler, P and Teece, D, (2014). Case study, dynamic capabilities and upstream strategy;supermaj EXP, Energy Strategy Reviews, 3, 14-20. Available on http;//dx.doi.org/10.1016/j.esr.2014.05.003.

Grant, R.M, (1996). Prospering in Dynamically-Competitive Environments; Organizational capability as knowledge intergration, organizational science, 7(4) 375-87.

Glover, (2020). Supply chain managment: implementation issues and researchopportunities , " the international journal of logistics management 9 (2) 1-20.

Glover & Laguna, (2020). The new science of extreme supply chain management, new york, Roullarga.

Galvaro, (2019). Anew introduction to supply chain and supply chain management:definitions and theories perspective, " international business research 5 (1) 194-206.

Geoffrion & Graves, (2020).Innovation Investment, Competitiveness, and perfomance in industrial firms, Thunderbird international Business Review, 48,6,867-890.

Gunderson, (2021).The Impact Of Environment and Entrepreneurial perception on Venture-Creation Efforts; Bridging the discovery and creation views of entrepreneurship. Entreprenuership Theory and practice, 34(5), pp 833-856.

Harrison, J.S, Hitt, M.A, Hoskisson, R,E, and Ireland, R.D, (2001). Resource complimentarity in business combinations; Extending the logic to organizational alliances. journal of management , 27(6), pp 679-690.

Hymer, S, (1976). The international operation of National Firms, phD. Thesis, Cambridge, MA MIT press.

Harrington, Boyson and Corsi (2019). XSCM: the new science of extreme supply chain management, new york, Roullarga.

Hull (2015). " Are supply(driven) chains forgoten?" the international journal of logistics management 16 (2) 218-236.

Hossain, assawapokee and khumawala, (2012). " Supply chain management: challenges and opportunities" international journal of global logistics and supply chain management 1 (2) 90-97.

Hemsen and Mledonovic, (2017). Resource complimentarity in business combinations; Extending the logic to organizational alliances . journal of management , 27(6), pp 679-690.International Chamber Of Commerce (ICC), Publication, 2010International Journal of Management, (1999, 2007) vol. 24 no.1, March 2007. Kenya, S.A (1999)105-116.International Journal of Productivity and Quality Management. 2010b. 6 (2) 249-268.

Tapscott, Ticoll, and Lowy, (2000). Digital Capital: Harnessing the power of business webs, Harvard Business School Press, Boston.

Trivellas, and Dargenidou, (2009). Organizational culture, job satisfaction and higher education service quality: The case of Technological Educational Institute of Larissa.

Janavier-james, (2019) "A new introduction to supply chain and supply chain management: definitions and theories perspective, " international business research 5 (1) 194-206".

Jacobs, F. R.; W. L. Berry; D. C. Whybark; and T. E. Vollmann, (2019). ManufacturingJournal ofWorld Business, 43,290–306 Yusuf, Y.Y., Adeleye,

E.O., and Sivayoganathan, K.(2003), "Volume flexibility: the agile manufacturing conundrum," Management Decision, Vol. 41, No.7, pp. 613-624.

Zhang, X. (2010). On How Organizational Culture Impact its Performance and Competitiveness. Proceedings at the E-product E-service and E-entertainment (ICEEE) international conference held at Henan, 7-9 Nov, 2010.

Jaillet, (2015).A new introduction to supply chain and supply chain management: definitions and theories perspective, " international business research 5 (1) 194-206.

Kenya Sugar Board Year Book of Statistics, (2012).

Kenya's Sugar Industry, PKF Consulting ltd, (2005).

Kenya, S. B(2004) " Sugar Board Strategic Plan (2004-2007), Nairobi.

Kenya, S.B(2003), Kenya Sugarcane Board Yearbook of statistics Nairobi.

Kombo (2009). Proposal and Thesis writting; An introduction; Nairobi, Paulines

Publication Africa.

Kothari, (2014). Research Methodology; Methods and Techniques; New Delhi, India, New Age International Publishers, Second revised edition.

Kransdorf, (2012). " The management page high state levels- not the answer – Amoldkransdorff reports on supply chain management; financial times june 4 : 16.

Kiarie, (2017). Facility Location and the general perfomance of the kenyan manufucturing sector.Kenya Sugarcane Authority Yearbook of statistics Nairobi.

Lis and Lin, (2006). Supply Chain Mnangement Systems in Kenya manufucturing sector.

Lampart, cooper and pagh,(1988). " Supply chain managment: implementation issues and research opportunities," the international journal logistics management 9 (2) 1-20.

Larson, hulldurson, (2004). " Logistcs verses supply chain management, an interational survey" an international journal of logistic research and applications 7 (1) : 17-31.

Lee and Billington, (2020). " Managing supply chain inventory: pitfalls and opportunities" sloan management review 35 (3) 65-73.

Larpote, Norbert and Arpin, (2018).Research Methodology; Methods and Techniques; New Delhi, India, New Age International Publishers, Second revised edition.

Larpote, Nobert & Tailleffer, (2018).The Impact Of Environment and Entrepreneurial perception on Venture-Creation Efforts; Bridging the discovery and creation views of entrepreneurship. Entreprenuership Theory and practice, 34(5), pp 833-856.

Marangu, (2016), Research Methods, Qualitative and Quantitative Approaches, Nairobi,

African Centre For Technology Studies Press.

Marangu, Oyagi & Gingera, (2021)). Research Methods, Qualitative and QuantitativeApproaches, Nairobi, African Centre For Technology Studies Press.

Melynk, (2017). "Supply chain managment: implementation issues and research opportunities , " the international journal of logistics management 9 (2) 1-20.

Meller, (2020), " A new introduction to supply chain and supply chain management: definitions and theories perspective, " international business research 5 (1) 194-206.

McCabe, G.P, Moore, D.S and Craig, B.A (2014). Introduction to the practice of statistics. 8ed.New York, NY; W.H Freeman and co.

Miot, H.A, (2017). Assesing Normalcy of Data in clinical and Experimental Trials. Journal Vascular Brasileiro, 16 (2).

Min, jayaraman and sirvastava, (2018). " Combined location rooting problems: a synthesis and future research directions, " European journal of operational research 21, pp 121-137.

Mugenda and Mugenda, AG (2003). Research Methods, Qualitative and QuantitativeApproaches, Nairobi, African Centre For Technology Studies Press.16(2).

Miot, (2017). Assesing Normality of Data in Clinical and Experimental Trials. Journalvascular Brasreillo, 16(2).

Machuki, (2011). The influence of Exrternal Environment on the Perfomance of Publiclyquoted companies in kenya., prime journals, business admnistration and management (BAM) vol 1(7),   pp 205-281, june 28́th.

Mc-Graw, (2018). Organizations Unfettered: Organizational form in an information intensive economy, The Academy of Management Journal, 44(6): 1135-1148.

Masiko, (2013). Supply Chain Design and the kenyan Retail Banking Sector.

Mungai, (2014).   Operation Assesment and Perfomance of the Kenyan Real Estate Sector.

Melynk, lumos, vorkoka, burns and sandor, (2021): " Mapping the furture of supply chainmanagment: adelphi study, " the international journal of production research 47 (16): 4629-4653.

Melynk, davis, spekman and sandor, (2020), " Outcome driven supply chains" MIT sloan management review 51 (2) 33-38.

Nickels, (2018), "Mapping the furture of supply chain managment: adelphi study, " theinternational journal of production research 47 (16): 4629-4653.

Nangare and kikami (2021). Supply chain managment: implementation issues and research opportunities, " the international journal logistics management 9 (2) 1-20.

Nozick and turnquist, (2018). " Inventory, transportation, service quality and the location of distribution centres," european journal of operational research, 129, 362-371.

Ozsen and coullard, (2003). " Capacitated facility location model with risk pulling,"

Otieno and Getono, (2017). Supplier Information Sharing and Perfomance of Public Secondary Schools in Nairobi city County in Kenya.

Onyango, Obrien and Ghodspour, (2015). The association between facility location and perfomance of kenyan manufucturing companies.

Odon and Henson, (2002). Data screening : Essential techniques for Data Review and Preperation. Paper presented at the Annual meeting of the South West educational research association, (Austin, TX. Feb.14-16).

Pallant, J, (2005). SPSS Survival Manual; Astep by step guide to Data Analysis using SPSS for windows (V.12).

Porte, (1996). Research Methods, Qualitative and Quantitative Approaches, Nairobi,African Centre For Technology Studies Press.

P, feffer J, and Salancik, G, (2003). The external control of organizations; A resource dependence perspective (1st edition) stanford university press, stanford, CA.

Pavlou, P A, and El Sawy, O. A, (2011). Understanding the Elusive Black Box Of Dynamic capabilities. Decision Sciences Journal vol. 42(1), 239-273.

Privitization Commission Ref:PC/T/08,2010 and Ref: PC/TRA/CONF/10/2013).

Scott, A.J, (2000). Economic Geography: the great half century, cambridge journal of economics vol 24, no. 4 july.

Shen, (2000). " Efficient algorithms for various supply chain problems, " Phd desertation, department of industry engineering and management sciences, North western university, evernstone, 11 pp 60-208.

Shen,coullard and daskin, (2003). " A joint location inventory model" transportation science, 37 1 pp 40-55.

Shen, Daskin, (2003), " Trade offs between customer service and cost in intergrated supplychain design framework"

Shimchi- levi, kaminiski, (2003). Designing and managing the supply chain: concepts, strategies and case studies, second edition, mcgraw-hill, irwin, boston, ma.

Synder, (2013), " Supply chain robustness and reliability: models and algorithms.

Synder and Daskin, (2003). " Reliability models for facility locations: the expended failure cost case.

Fisher (1999). " What is the right supply chain for your product? Havard business review 75 (2) 105-116.

Feldman and Austretch, (1999).Inventory Management and perfomance of the construction sector in Kenya.

Petit, Beresford, (2019). " Emergency relief logistics: an evaluation of military, non military and comprite response models," international journal of logistics 8 (4): 313-331.

Pavlou & Elsauvy, (2011). " A conceptual frameworkfor supply chain management. A structural intergration supply chain managment 10 (11) 47-59.

Pettit & Beresford, (2019), Production Planning, Control, and Integration.New York:

Pajk, Indihar Slemberger, Kovacic, (2010). Operation Management Systems and the changing business needs.

Paugh, (2018). Operation Assesment and Efficiency in service delivery in KenyanManufucturing sector.

Rideghierh, (2017). Inventory Management and the construction sector.

Rivera, (2019). " Am i doing architecture or design work? IT proffessionals 9 (6) 46-48november/december.

Samaranayake, (2019). " A conceptual frameworkfor supply cain management. A structural intergration supply chain managment 10 (11) 47-59.

Sekaran, (2003). Research methods for business skill building approach, 6th edition. John Wiley and Sons, W. Sussex.

Syengo, (2015). Supply Chain Practices and procurement effectiveness in Kenyan manufucturing sector.

Sengbech, (2015). Supply Chain design and perfomance of the kenyan manufucturingindustry.

Sreeji and Vinaya, (2017). Inventory Management and perfomance of the construction sector in Kenya.

Spens and Dusk, (2020). " Developing a framework for supply chain management", international journal for logistics management.

Sipper, D., and R. L. Bulfi, (1997). Production Planning, Control, and Integration.New York: McGraw-Hill, 1997.

Santos-Vijande, López-Sánchez, Trespalacios, (2012). "How organizational learning affects a firm's flexibility, competitive strategy, and performance", Journal of Business Research, Vol.65, No.8, p. 1079-1089.

Supply Chain Management- An International Journal, 12 (2), 116–128.

Twati & Gammack,(2006). The impact of organizational culture innovation on the adoption of IS/IT: the case of Libya. of Enterprise Information Management 19(2), 175-191.

Tyndall, Gopal, Partsch and Kamauff (2010). Operation Assesment and Efficiency in service delivery in Kenyan Manufucturing sector.

Teece, D, Pisano, G and Shier, A, (1997).Dynamics, capabilities and strategic management. Strategic management journal , 18(7), 509-534.

Teece, D.J, and AL-Aali A Y (2013). Knowledge, Entrepreneurship and capabilities ; Revising theory of MNE, Universia Business Review, Cuarto Trimestre, 18-32

Viswanathan (2019). " Supply chain network design, archictecturing a green future" (aberdeengroup february 19)pp. 1689-1702. 59.

Visanadham, N, (2000). Analysis of Manufacturing Enterprises: An Approach to Leverage Value Delivery Processes for Competitive Advantage.

Viginia Mescher, (2020). A history of Sugar and Sugar refining in the kenyan manufucturing sector.

Wagner, C, (2006).Breaking the knowledge acquisition bottleneck through conversational knowledge management.

Wang, C, L and Ahmed, P.K (2007). Dynamic capabilities; A review and research agenda. International journal of management reviews, 1, 31-51.

Wanyande, (2018). Sugar industry manufucturing in kenya, Raw material and marketinghostility.

Wiley (2017). Knowledge, Entrepreneurship and capabilities; Revising theory of MNE, Universia Business Review, Cuarto Trimestre, 18-32.

Wo, Melynk and Fynn,(2018). Dynamics, capabilities and strategic management. Strategic management journal , 18(7), 509-534.

Wolfgang Fengler, (2020).Designing and managing the supply chain: concepts, strategies and case studies, second edition, mcgraw-hill, irwin, boston, ma.

Yilmaz and Ergun, (2008). Organizational culture and firm effectiveness: An examination of relative effects of culture traits and the balanced culture hypothesis in an emerging economy.

Zahra, S.A and George, G. (2002). Absorptive capacity; A review, reconceptualization, and extension, The academy of management review, 27(2), 185-204.

Zollo M, and Winter S.G, (2002). Deliberate learning and the evolution of dynamiccapabilities organization science, 13, 339-351.

Zaja, (1999). Business Research Methods.

Zygiaris, S, (2000). Planning and Control for Supply Chain Management . 6th ed.

APPENDICES

Apendix I:NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: 438824

Date of Issue: 09/June/2022

RESEARCH LICENSE

This is to Certify that Mr.. Evans Wambasi Misiko of Masinde Muliro University of Science and Technology, has been licensed to conduct research in Bungoma, Busia, Homabay, Kakamega, Kisii, Narok, Samburu, Siaya, Transnzoia, Vihiga, Westpokot on the topic: Supply Chain Design and Performance of State owned Sugar Manufacturing Firms in Kenya for the period ending : 09/June/2023.

License No: NACOSTI/P/22/18164

438824

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR
SCIENCE, TECHNOLOGY &
INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

85

APPENDIX II:QUESTIONNAIRE

Introduction

My names are Evans W. Misiko, a student at MMUST conducting a research on a topic in operations management entitled " Supply Chain Design and Perfomance of state owned Sugar manufacturing Firms in Kenya". This is in partial fulfilment of the requirements for the Award of a post graduate degree in Operations Management. Kindly spare your 10 minutes to respond to these questions. All information you provide will be treated with utmost confidentiality, not identifiable to you and only used for academic purposes. The purpose of this thesis is to analyze the current trends in the industries which have implemented SCD, then seek the effect on the performance of state owned sugar manufacturing firms in kenya

Findings of this research may be used to create a Conducive working environment, enhance Operational Performance of functional areas of State owned sugar Companies and most importantly contribute to the field of knowledge in this particular area. This explains why your support in terms of time, concern and attention is worthwhile. Your willingness and readiness to offer credible and required information will go a long way bringing a positive result in our companies both in academic and operational efficiency. Your support and cooperation will be met with great appreciation. I can be reached on 0725438378 or 0753628409. Thank you and God bless you abundantly.

<u>**PART A: Personal Information**</u>

(Instruction- Tick/ Fill where appropriate)

1. Name of your company

   Nzoia ( )   Chemelil ( ) Muhoroni ( )   Sony ( )

2. Indicate your gender

    Male ( )   Female ( )

3. In which of the following age brackets do you fall?

   20-30 ( )   30-40 ( )   40-50 ( ) 51 and above ( )

4. Indicate your Marital status .

    Single ( ) Married ( ) Other specify ( )

5. What is your highest academic qualification?

   Secondary ( ) Diploma( ) Bachelors ( ) Masters ( ) PHD( )

6. Total no. Of years you have worked for this organization.

   Less than 5yrs ( ) 6yrs ( ) 11yrs ( ) 16 yrs ( ) 20 yrs ( )

7. Indicate your work experience

   1yr and below( ) 1-5 yrs ( ) 6-10 yrs( ) 11-20 yrs ( )   21yrs plus

PART B: PERFOMANCE

In your own opinion; what are the effects of each variable on competitiveness? Please tick one space against each statement as indicated below, strongly agree being the highest mark (total agreement with the particular statement) and strongly disagree the lowest mark (total disagreement with the particular statement)

Key SA Strongly Agree **A** Agree **N** Neither Agree Or Disagree **D** Disagree

Effects of facility location on performance	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	5	4	3	2	1
Improved performance after maximum utilization of cane yard space					
Increased performance after automation of ware house and weighbridges					
Improved performance after efficiency and streamlining of processes in ware house and weighbridge					
Increased performance as a result of low carrying costs, (quick build to shop times).					
Increased performance due to low obsolescence costs (short lead times) i.e fast flow of raw materials from out growers to the processing facility.					
There is streamlined structure of the bill of materials to facilitate quick and accurate communication of requirements to manufacturing.					
There was a lot of savings on the cost of transport due to full truck load technique, FTL					
There was improved performance after adoption of mobile field weighbridges.					

Effect of Operations Assessment on Performance					
There is minimization of production damages.					
There is minimization of packaging costs.					
There is tracking of inventory of raw materials and finished goods at all times.					
There is a strong software for tracking of raw materials and products from point A to point B.					
There is a strong forecasting software to take care of seasonal peaks, changes in shopping demands & transportation issues.					
There is streamlining of product and inventory management in the supply chain .					
There are repetitive activities in inspection of harvested materials in the field as well as finished goods in warehouse.					
Theres cost postponement of ceasing to invest in supply chain personnel and technology.					
There is configuration for customization at the end of the product finish line rather than at product initiation stage.					
Theres design of roads, bridges, and culverts that link field facilities to manufacturing plant that aid in cost minimization..					

Effect of Inventory Reduction on Performance					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	5	4	3	2	1
Theres saving of energy costs in the warehouse.					
There is ease of special order entry and manufacturing					
The structure of the bill of materials usually leverage capability of the order management system					
Warehouse inventory is usually maintained at the bare minimum to cut costs.					
Theres redundancy of machines or operations due to shortages of raw material inventory.					
Theres storage of finished goods at appropriate distribution points close to customers.					
Theres keeping of organizations farm inputs appropriately at the outreach offices for ease access to customers.					
Theres matching of supply as closely as possible with demands.					
Theres use of Information Technology in keeping track of your inventory both at the field, warehouse and at the distribution centers.					

Theres reliance on dependable high quality suppliers.					
Theres strive to establish and keep long term relationship with suppliers.					
Theres use of extension field staff to offer extension services to customers in order to improve raw material quality.					
There are continuous improvement programs constantly dissipated to farmers as continuous quality improvement strategy and customer retention.					
Information exchange between organization and trading partners is accurate, complete, adequate and reliable e.g outgrow recruitment for targeted cane planting					
Moderating effect of organizational factors on the relationship between supply chain design and performance					
	5	4	3	2	1
Good Management styles applied to facility location, operational assessment and inventory reduction will not have a positive effect on territory optimization					
Good Management styles applied to facility location, operational assessment and inventory reduction will not have a positive effect on cost reduction					

Good Management styles applied to facility location, operational assessment and inventory reduction will not have a positive effect on Profit Maximization						

What are the moderating effects of technological factors on the relationship between supply chain design & performance?

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
	5	4	3	2	1
Modern and appropriate technology adopted in facility location, operational assessment, and inventory reduction will not have a positive effect on cost reduction					
Modern and appropriate technology adopted in facility location, operational assessment and inventory reduction will not have a positive effect on Market share					
Modern and appropriate technology adopted in facility location, operational assessment, and inventory reduction will not have a positive effect on territory optimization.					