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SUPPLY CHAIN BULLWHIP AND PERFORMANCE OF AGRO PROCESSING COMPANIES IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

This study explored on the relationship between supply chain bull whip and performance of agro-processing firms in Nairobi City County, Kenya. The specific objective were supply chain complexity, and consumer expectations on performance of agro-processing firms City County, Kenya. This study was anchored on different theories relevant to specific variables under this study. The target population of this study was 182 respondents. This was a census survey meaning purposive sampling techniques was used. The research design was descriptive research design. To establish the contribution of supply chain bullwhip on the performance of agro-processing firms in Nairobi city county. The researcher's collection procedure will be dropping and picking the same after two weeks. 10 % (18) of the respondents were pilot tested. Research instruments were both open and closed and ended questionnaire. Data was analyzed with the help of statistical package for social science version 28 and the same to be presented in a form of tables and figures. Pilot results indicated a good hope from the indicators analysis of 0.7 reliability and 0.5 for content validity. The study found that A unit change in Polity commitment management would thus lead to a .470 effect on performance of Agro processing firms in Nairobi city County, Kenya sector ceteris paribus; This implies that among other factors, Supply chain complexity, and Long lead time are significant determinants of performance of Agro processing firms in Nairobi city County, Kenya.

Key Words: Supply Chain Complexity, Long Lead Time, Supply Chain Bull Whip, Performance, Agro-Processing Firms

Background of the Study

The supply chain includes manufacturers, suppliers, transporters, warehouses, wholesalers, retailers, other intermediaries and even customers themselves. Any product traded on the consumer goods market, in its evolution from raw material to finished products, undergoes a series of successive transactions on the business-to-business market. For example, when a final consumer purchases a bottle of Coca Cola, he/she does not buy directly from Coca Cola, but from an intermediary (for example the hypermarket or neighborhood store) and the product goes through several transactions on the business-to-business market on the circuit Coca-Cola wholesaler, retailer and final consumer. This supply chain consists of all parties involved, directly or indirectly, in fulfilling a customer request. Within each organization, such as a manufacturer, the supply chain includes all functions involved in receiving and filling a customer request. These functions include, but are not limited to, new product development, marketing, operations, distribution, finance, and customer service". Scholars state that a typical supply chain is a network of materials, information, and services processing links with the characteristics of supply, transformation and demand (Du & Jiang, 2019).

There are three traditional stages in the supply chain: procurement, production and distribution. Each one of these stages may be composed of several facilities in different locations around the world. For example, in the automotive industry assembly plants are located in others countries than suppliers of different components and distribution is worldwide. He describes a supply chain as "a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer". According to Du and Jiang (2019), there is three degrees of supply chain complexity: a "direct supply chain," an "extended supply chain," and an "ultimate supply chain". The direct supply chain consists of a central organization, its suppliers and its customers. In addition, the extended supply chain includes suppliers of the immediate supplier and customers of the immediate customer. The ultimate supply chain includes all organizations that are involved in all flows of products, services, finance, and information from the ultimate suppliers to the ultimate customers. Also, the ultimate supply chain encompasses functional intermediaries such as market research firms, financial and logistics services providers. The supply chain can have different degrees of complexity related to the numbers of members and the variety of business processes, but always there is a central organization. This organization can manage the entire supply chain or not and even if the supply chain is not managed, the supply chain as a phenomenon of business -still exists. She suggest that a supply chain is: "Life cycle processes comprising physical, information, financial, and knowledge flows whose purpose is to satisfy end-user requirements with products and services from multiple linked suppliers" (Hosseini & Mehrjerdi, 2016).

According to this definition, the supply chain encompasses processes that cover a broad range of activities including sourcing, manufacturing, transporting, and selling physical products and services. Life cycle refers to both the market life cycle and the usage life cycle and these are not the same for durable goods and services. Therefore, product support after the sale becomes an important supply chain component. An integrated supply chain model can generally contain three interrelated flows: material flows (which has three different stages (purchasing, transformation and distribution), informational flows (electronic data exchange or website linkages) and financial flow (which include the payment to suppliers and subcontractors for the goods and services and the payment by the customer to retailer for the final product). Obviously, physical distribution is a critical part of supply chains and information, and financial components are as important as physical flow in many supply chains. In addition, we must underline the role of knowledge inputs into supply chain processes. For example, the supply chain process for new products requires close coordination of intellectual inputs (Isaksson & Seifert, 2016).

The flows direction in the supply chain is not only forward, from first supplier to final customer. Goods can flow back up the supply chain for different reasons such as service or repair, remanufacturing, recycling or disposal. Reverse logistics refers to a set of programs or competencies aimed at moving products in the reverse direction in the supply chain (i.e., from consumer to producer) and related activities may include handling product returns, recycling, reuse of materials, waste disposal, refurbishing or remanufacturing. Finally, we must note that a supply chain has multiple-linked suppliers. There are many different configurations for the supply chain. Some are very short and simple, such a small grocery buying vegetables directly from the farmer and the others are long and complicated like a fish cannery that source from fishermen and sell the products through a retail network. Increasingly more companies' coordinates in both upstream and downstream echelons in a supply network the material and information flows among several different suppliers, manufacturers and distributors (Isaksson & Seifert, 2016).

Statement of the Problem

The problem of poor performance of agro-processing firms is through bullwhip effect associated with order batching, which are in the forms of either periodic ordering or push ordering. Price fluctuation and forward buying are other important factors causing the bullwhip effect. According to Mackelprang and Malhotra (2015) they observed from 2021 to 2024 July supply chain bullwhip affected the performance of agro-processing firms resulting to loss of profit of 2018 million in that sector, showing a descending decline for the last three years. Amazon is one of the well reputed fortune 500 companies that handles bullwhip effect effectively. The firm normally uses data mining techniques to determine where customers are possibly interested in their products and services and keep some orders in advance. This helps the agro-processing firm to handle any sudden and uneven demands, promptly. He investigated the advantage of supply chain bullwhip on performance of agro-processing firms. Rafati / Journal of Future Sustainability 2 (2022) 83 their own forecasts on incoming orders, with an information enriched Supply Chain bullwhip where customer demand data was shared throughout the chain. They explained that SI was essential to reduce order variance at higher levels of the chain. They provided more comprehensive discussions on replenishment rules, forecasting, and the bullwhip effects in supply chains.

According to Mackelprang and Malhotra (2015), agro-processing firms are not performing due to supply chain bullwhip. These techniques help us determine where clients are located, how often they order and how to make the pay for their purchases. During the past two decades, there have also been tremendous developments in enterprise resource planning, which would help manage the entire supply chain. There are still many unexpected events in the world which would not be expected through forecasting methods. The Covid-19 was one of the biggest issues which influenced the world economy. In view of the foregoing this research is carried out in the Kenyan context so as to improve performance of agro-processing firms through supply chain bullwhip effect.

Objectives of the Study

The general objective was to establish the relationship between supply chain bullwhip and performance of agro-processing firms in Nairobi City County, Kenya.

Specific Objectives

i. To examine the effect of supply chain complexity on performance of agro-processing firms in Nairobi City County, Kenya.

ii. To assess the effect of long lead time performance of agro-processing firms in Nairobi City County, Kenya.

LITERATURE REVIEW

Theoretical Framework

Green Theory

Green theory and climate change Climate change is the dominant environmental issue of our age, caused by our dangerous reliance on fossil fuels. Green theory helps us to understand this in terms of long-term ecological values, rather than short-term human interests (Green, Gottlieb & Parcel. 1991). These interests are generally pursued by states through investments in technology, but there is no easy technical solution to human-induced climate change. From the perspective of green theory, this technical impasse requires a change in human values and behavior and therefore presents an opportunity for political innovation or even a transformative shift in global politics. IR theory can explain why climate change is a difficult problem for states to solve because of economic competition and disincentives to cooperation (Green, 2004).

However, it cannot provide an alternative framework to explain how this might be addressed. IR remains overly focused on states and their national interests rather than other actors that may be more cooperative, such as cities and communities, or non-governmental organizations and green social movements. A green theory perspective on climate change understands it as a direct consequence of human collective choices. Specifically, these choices have led to historically anthropocentric economic practices of historically arbitrary political groups (states), who have exploited nature in their own short-term interests. Climate change presents a clear case of injustice to both present and future humans who are not responsible for causing it and to the ecosystem as a whole. Therefore, a solution requires an eccentric theory of value and a more ethical than instrumental attitude to human relations in our common future. Green theory helps us to redefine issues such as climate change in terms of long-term ecological values rather than short-term political interests (Green, 2004).

Green theory shares this opposition which is one of the main discourses of critical theory that explains why some scholars accept green theory inside the critical theory. In addition to being critical, Green theory is considered as a post-positivist theory (Green, Gottlieb & Parcel. 1991). Positivism assumes that man is separate from the rest of nature and must dominate nature, reducing nature to an object level by describing it as a tool for the development of humanity. Positivism as the dominant paradigm paves the way for the undue use of resources and the destruction of nature. From this point of view, it would not be wrong to say that the green political theory in international relations has a post-positivist nature. Green theory is also positioned as a sub-branch of International Political Economy due to shared assumptions and aims. One aim of the International Political Economy is to provide alternative solutions to global ecological problems. Green theory can also be considered among normative theories because of the importance it attaches to concepts such as environmental justice. However, it should be noted that, wherever green theory is positioned, all these approaches position the green theory under critical theory (Green, 2004).

Conceptual Framework

A strong conceptual framework underpins good research. A conceptual framework in research is used to understand a research problem and guide the development and analysis of the research. It serves as a roadmap to conceptualize and structure the work by providing an outline that connects different ideas, concepts, and theories within the field of study. A conceptual framework pictorially or verbally depicts presumed relationships among the study variables.(Yin, 2012). A conceptual framework draws upon existing theories, models, or established bodies of knowledge to provide a structure for understanding the research problem.

It defines the scope of research, identifying relevant variables, establishing research questions, and guiding the selection of appropriate methodologies and data analysis techniques.

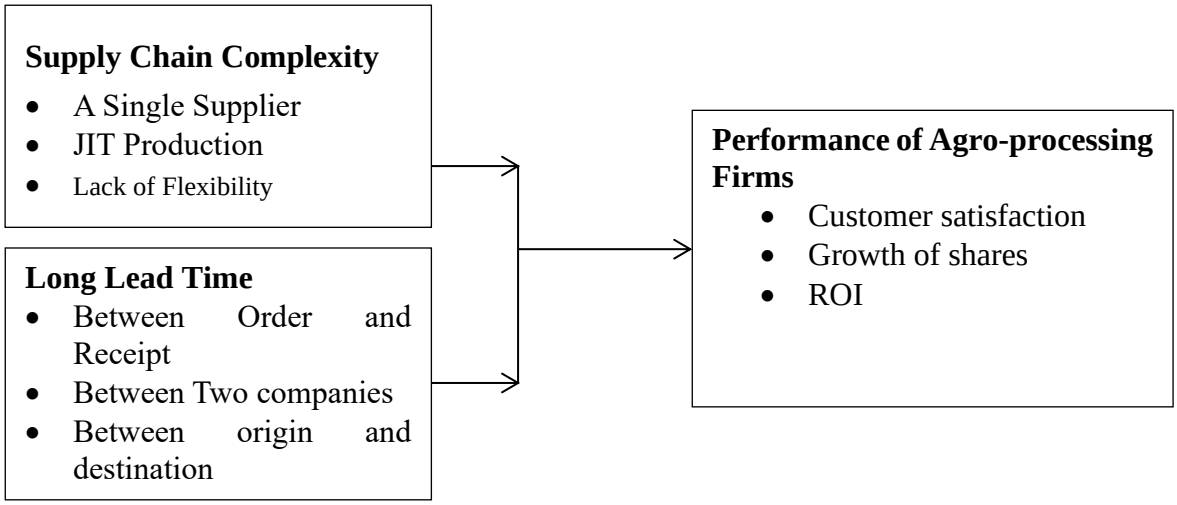

Figure 2. 1: Conceptual Framework

Supply Chain Complexity

Supply chain is a complex network of business entities involved in the upstream and downstream flows of products and/or services, along with the related finances and information. Supply chain management (SCM) involves the systemic and strategic coordination of these flows within and across companies in the supply chain with the aim of reducing costs, improving customer satisfaction and gaining competitive advantage for both independent companies and the supply chain as a whole (Okumu & Bett, 2019). Operating in a dynamic and uncertain environment, a supply chain is definitely a complex system with various companies, high number and variety of relations, processes and interactions between and within the companies, dynamic processes and interactions in which many levels of the system are involved and vast amount of information needed to control this system (Okumu & Bett, 2019).

Complexity inherent in the supply chain is observed in different forms and origins: static complexity, that is related to the connectivity and structure of the subsystems involved in the supply chain (companies, business functions and processes); dynamic complexity, that results from the operational behavior of the system and its environment; and decision making complexity that involves both static and dynamic aspects of complexity. The complex nature of supply chain adds to difficulty of managing the supply chain, so that it almost becomes common sense to say SCM is about managing the complexity of the supply chain. Although there are certain difficulties in dealing with complexity in the supply chain, numerous studies support that managing complexity leads to better supply chain performances. Thus, integrating complexity management into SCM is a necessary action. Before reviewing the approaches to managing complexity in the supply chain, it is crucial to characterize the supply chain complexity and discuss its drivers. Understanding and analyzing the complexity drivers in advance may allow developing a clear strategy in efforts to manage the supply chain complexity (Mahalingam, 2020).

The aim of this is to review the typical complexity drivers that are faced in different types of supply chains and present the complexity driver and solution strategy pairings based on good

industry practices. A meta-synthesis of good practices serves as a guideline in developing supply chain complexity management system. The remainder of the research is organized as follows. gives a review of the literature on supply chain complexity and its drivers; presents solution strategies to deal with complexity extracted from various good practices using a systematic review; discusses complexity management approaches that would assist decision-makers in formulating appropriate strategies to deal with complexity in their supply chains; and concludes the paper and points out directions for future research (Mahalingam, 2020).

Complexity in a supply chain grows, as customer requirements, competitive environment and industry standards change, and as the companies in the supply chain form strategic alliances, engage in mergers and acquisitions, outsource functions to third parties, adopt new technologies, launch new products/services, and extend their operations to new geographies, time zones and markets (Okumu & Bett, 2019). In other words, the growth of supply chain complexity accelerates with trends such as globalization, sustainability, customization, outsourcing, innovation, and flexibility. We can distinguish between three types of supply chain complexity: static, dynamic and decision making. While static (structural) complexity describes the structure of the supply chain, the variety of its components and strengths of interactions; dynamic (operational) complexity represents the uncertainty in the supply chain and involves the aspects of time and randomness. The static-dynamic distinction has been primarily used to study complexity in manufacturing systems. From the static aspect, the supply chain system is made up of high number of elements, variety and interactions, and considering them all when making a decision goes beyond the capacity of the human decision maker (Miller, 1956; Simon, 1974; Warfield, 1988). From the dynamic aspect, the fact that the system is dynamic, non-predictable, and non-linear adds another layer of complexity to decision making in the supply chain. As a result, complexity of decision making in the supply chain is associated with the volume and nature of the information that should be considered when making a supply chain related decision. One should note that the three complexity types are interrelated, and they should not be considered in isolation (Mahalingam, 2020).

A supply chain complexity driver is any property of a supply chain that increases its complexity. The classification of types of supply chain complexity (i.e., static, dynamic, decision making) corresponds with the classification of complexity drivers according to the way they are generated: via physical situation (e.g., number of products), operational characteristics (e.g., process uncertainties), dynamic behavior (demand amplification), and organizational characteristics (e.g., decision making process, IT systems) . Another classification of drivers is according to their origin: internal, supply/demand interface, and external/environmental drivers. Internal drivers are generated by decisions and factors within the organization such as the product and processes design (Spiliotis et al., 2021). These drivers are relatively easier to leverage since they remain within the span of control. Drivers generated within supply and/or demand interface (in cooperation with suppliers /customers) are related to the material and information flows between suppliers, customers and/or service providers. These drivers are somewhat manageable since they remain within the span of influence and the level of coordination between supply chain partners plays a significant role when dealing with these drivers. Thus, power and trust mechanisms that affect the nature of supplier/customer relations are also important factors which need to be considered as complexity drivers. External drivers are generated through mechanisms that the company has little, if any, control over such as market trends, regulations and other various environmental factors. This is mainly due to the fact that the external drivers are outside the system boundary of the supply chain, i.e. out of the span of control of the decision maker, yet they can be monitored, analyzed, and acted upon with robust decisions to adapt and change. 's framework that discusses this issue from the manufacturing company's perspective could be extended throughout the supply chain (Mahalingam, 2020).

Long Lead Time

Long lead items are materials or equipment that require months to years from order to delivery. Long lead items are typically complex goods with many steps in the procurement process. Note; it can also be a more common component or material depending on the current market. In uncertain environments, flexibility to adapt previously made decisions to recently observed outcomes is always valuable (Mogoi & Osoro, 2022). A special case of this general concept has found vast use in supply chain (SC) literature such as quantity flexibility or buyback contracts. However, most SC contracts have dealt with quantity flexibility while totally ignoring lead time flexibility to the best of our knowledge. Lead time flexibility refers to an arrangement between the retailer and the transporter or the manufacturer, where delivery lead times are not firm when orders are placed but they evolve into firm(er) times. This evolution is controlled by the retailer as long as it is within limits posed by the transporter/manufacturer (Mahalingam, 2020).

The retailer monitors its demand and requests lead times accordingly; high demand observations lead to shorter lead times, e.g. expediting deliveries via using a faster transportation mode or via rushing the production at the manufacturer or buying a portion of the production lot from a spot market (Mogoi & Osoro, 2022). Conversely, low demand observations suggest using a slower transportation mode or postponing deliveries from the manufacturer where inventory holding costs are lower. For example, Boeing provides delivery lead time flexibility to its customers, such as Delta airlines. Airlines place aircraft orders to Boeing without firm delivery (lead) times, timing is made firmer with expediting or postponing deliveries as airlines observe more passenger demand. Under uncertainty, flexibility provides a hedge that distributes or reduces the risk. In the well-known example of quantity flexibility contracts the manufacturer and the supplier share the risk by promising the availability and purchase of a certain amount of goods. This set up gives retailer some leverage to counter against extreme demands which are unlikely but possible. It is possible to provide a similar hedging mechanism to retailer with flexible lead times. Our objective is to study this hedging mechanism, its benefits to the retailer and also to SC overall (Mahalingam, 2020).

We believe that flexible lead times can be more acceptable to a manufacturer because manufacturer' ssales (order quantities for retailer) are never altered, unlike quantity flexibility mechanisms. Especially, the manufacturers, that want to stabilize their demand with a long term relationship with the retailer, appreciate the constant lot sizes (Mogoi & Osoro, 2022). Moreover, our continuous time flexible lead time model studies costs over along horizon and hence departs from the established SC literature which focuses mostly on newsvendor type models. The purpose of our work is threefold: To further the properties of the (R, Q) inventory model with regard to lead times. Although lead time management is extremely important in competitive environments and is conceptually emphasized by operations management strategies (i.e., just in times, time based com-petition and quick response), their study is limited perhaps because of technical difficulties such as lack of convexity and order crossing. The current paper carefully handles these difficulties. To develop a flexible lead time model which can improve the performance of the whole SC even when the order quantity is fixed for the sake of the manufacturer. Most of the paper is devoted to measure the benefits of the flexible lead times for the retailer (Mahalingam, 2020).

However, it also takes a larger SC perspective and studies how lead time flexibility can be provided and at what cost. To obtain important management insights about how the key cost/demand parameters affect the performance of the SC (Mogoi & Osoro, 2022). The paper finally discusses when the lead time flexibility improves the SC performance and when not. We have to note that lead time demand is a crucial parameter when placing an order in a supply chain as it is used to determine inventory and order policies. In practice one has to investigate

and address what causes the main inefficiencies of a given supply chain and in this context the behavior of lead time demand becomes critical. It is interesting to note that authors such a state that limited information about lead time demand distributions are actually available. Typically, this inefficiency of information is defined in the form of the bullwhip effect (demand variance amplification) and the increase of the inventory level variance. Keeping both these parameters relatively small is one of the most significant challenges in supply chain management (Mahalingam, 2020).

The overall conclusion from literature is two-fold. First, the impact of stochastic lead times on supply chains can be reduced to the following: The bullwhip effect in supply chains caused by stochastic lead times only depends on the first and second moments of the lead time distribution i.e. the mean and variance (Mogoi & Osoro, 2022). Lead times have in all the investigated research been assumed to be; when treated as stochastic rather than deterministic. Second, surprisingly limited research has been published on how lead times actually behave. While it is recognized that lead time variance is actually a major source of bullwhip effect the authors have not been able to identify any comprehensive research into the nature of lead times. This leads to the conclusion that lead time behavior is of outmost importance for both academia and practitioners in the field of Supply Chain Management (Mahalingam, 2020).

Performance of Agro-processing Firms

The performance is "A set of metrics used to quantify the efficiency and effectiveness of supply chain processes and relationships, spanning multiple organizational functions and multiple firms and enabling supply chain orchestration" (Maestrini et al., 2017). The aim of every organization is to enhance the performance but for improvement they must need to measure it accurately first. Previously performance was measured by cost with the passage of time more financial indicator were added like return on asset, return on investment, sale and etc. Only financial indicators are not enough for measure overall and accurate performance, consequently, with invent of balance scorecard approach some operational indicators were add. Other approaches also added values in measuring supply chain like quantitative or qualitative measures, strategic, tactical and operational measures (Mahalingam, 2020).

A comprehensive review and revealed that for the good performance measure all the members should be considered, performance measure should consider both financial and non-financial items, all the levels of supply chain must be considered and all process of supply chain should be included so the performance should be measured by operational performance. Meanwhile, researchers had used many ways to measure the effects of risk sources and supply chain practices with different means like firm or organizational performance, product performance, operational performance, logistic performance, financial performance or operational performance. Nevertheless, indicators to measure above mention performance are alike (Mogoi & Osoro, 2022).

SCM had been measured by operational performance and its indicators were quality performance, flexibility performance, customer service, delivery performance and cost performance. Effendi (2015) has use logistic effect for SCM and its metric consisted on order fill rate, order fulfilment lead time, operations flexibility, inventory turnover and total logistics cost .

SCM has been measured SCM with organizational performance and its dimension was profit, cost, ROI and sale. It can be conclude that SCM performance had been measured by various ways like operational, organizational, firm, financial measures. A model has been developed for measuring performance and revealed that for measuring overall performance, these items should be considered cost, quality, flexibility, customer satisfaction, capacity, time,

consistency. Thus, this study will consider all the requirement of better operational performance (Mahalingam, 2020).

Several dimensions had been proposed for SCM approaches in literature. Mahalingam, (2020) had develop and verified five dimensions that are long range relationships, information sharing, leveraging the internet, advanced planning techniques and supply and distribution network structures and found a positive relationship with organizational performance. In addition he investigated SCM approaches by customer and supplier and relationships, postponement, agreed goals and vision, level and quality of IS and reward/risk sharing. This study found that all has positive relationship except customer relationship. Another study investigates internal integration, customer integration and supplier integration and found that customer integration did not significant positive impact of performance. Thus many studies have been conducted on SCM approaches that have revealed positive effect of performance (Mogoi & Osoro, 2022).

Empirical Review

Supply Chain Complexity

Analyzing and understanding complexity drivers helps us to develop and implement right strategies when dealing with complexity. An effective way of developing strategies is making use of good practices (Du & Jiang, 2019). Here, a good practice is defined as "any proven working practice which is far enough ahead of the norm to provide significant performance gains if implemented". At this stage of the study, good practices of complexity management in the supply chain were examined by means of a qualitative meta-synthesis. Qualitative meta-synthesis is an interpretive approach that seeks to discern meaningful patterns from various existing qualitative studies of the same or closely related topic by means of a systematic review. Good practices have been identified and gathered from various sources, such as reports of companies, consulting firms, service providers and other knowledge bases. After an initial screening 23 practices that are fulfilling the following criteria were further examined: the complexity reported in the practice must be supply chain related; the practice must have produced successful results; the documents must be accessible and provide clear and detailed enough information to continue with the survey (Ominde et al.,2022).

The selected good practices were reviewed systematically using a review protocol. In this study, information on the following characteristics have been used: type of the company, type of supply chain, complexities involved in the supply chain, the challenge the company is facing, complexity drivers of the challenge/problem, solution to overcome the challenge/problem, tools and techniques used, results achieved (Du & Jiang, 2019). Examining how the supply chain system interacts with its environment in this way allows us to gain a greater understanding of its behavior. When we look at the number of papers categorized according to type of complexity, it appears that decision making complexity has attracted much less scholarly attention than the static and dynamic types. It should be noted that a majority of the reviewed papers involve issues related to complexity of the supply chain decision making, since decision making complexity is a combination of dynamic and static complexities perceived by the decision maker during the decision making process. However their particular focus is not primarily on decision making complexity, which is the reason why decision making complexity seems to receive relatively little interest (Yang & Zhang, 2019).

In electronics supply chains, the complexity drivers tend to be mostly static in nature, such as high number of SKUs, wide variety of complex products, high number and variety of suppliers and customers and a complex supply chain network, bundled with demand and market uncertainties (Du & Jiang, 2019). In one of the reviewed cases, Motorola Inc., redesign of product to reduce complexity of the supply chain was used as a strategy. Motorola devised measures of product complexity in terms of supply chain effects and

redesigned their products whenever they have higher complexity than their competitors' products. In three of the practices the companies adopted a series of transformation strategies that would help them deal with complexity. The strategies facilitated end-to-end integration, collaboration with partners, visibility into operations and continuous improvement (Ominde et al.,2022).

Other areas where complexity may arise due to worldwide supply chains include working across different cultures, language and communication barriers, different legal systems, time differences, unreliable information, countertrade demands, a total landed cost that never equals the unit cost of what is purchased, and increased risk management requirements, particularly regarding the protection of intellectual property and currency fluctuations. Globalization brings with it no shortage of issues to manage, which increases complexity. Some observers argue that a fair portion of the increased risk and complexity faced by businesses today are largely a result of globalization (Yang & Zhang, 2019).

In some ways the battle against complexity is a logical progression after lean, which is a mature concept that is often applied narrowly as a battle against waste (Du & Jiang, 2019). Most sources address complexity by putting forth general rather than specific ways for tackling this issue. While these approaches are well and good, they are rarely specific enough for really understanding how to battle complexity. Complexity management should focus on eliminating bad complexity while exploiting the kinds of complexity that can lead to competitive advantage. The first step in this battle is recognizing that complexity exists and that it must be managed. Fortunately, some powerful ways exist for addressing complexity once a firm moves beyond the awareness stage (Ominde et al., 2022).

Long Lead Time

A long lead time is when a process takes a relatively long time to be completed, compared to a business's average lead time(s) or industry benchmarks. The actual time may vary depending on the business, industry, processes, and location (Du & Jiang, 2019). The retailer should always delay the choice of lead time as late as possible, i.e. should exercise its lead time option later rather than earlier. In our settings, delaying the exercise time, in spite of increases manufacturer's costs, provides higher profits for the SC. On the other hand, flexibility savings are not monotone in the magnitude of the lead time option. A moderate value of α, 25% of the lead time in our experiments, provides the most savings to the retailer. We illustrate that the lead time flexibility helps the retailer most when the demand uncertainty is high. Also our experiments on inventory cost parameters indicate that retailer's flexibility savings are higher when the retailer provides a relatively low level of customer service. In addition, when the fixed cost is large, flexibility cost savings are small; the retailer must first deal with the large fixed cost instead of demand uncertainty. To provide a broader perspective, flexible lead time providers, a transporter and a manufacturer in a SC, are discussed and their costs are modelled. The costs of the retailer and the flexible lead time providers determine if the SC should implement a flexible lead time strategy. As our experiments illustrate, flexible lead times do not necessarily improve the SC performance. We are not advocating for their common use but for their analyses (Yang & Zhang, 2019).

In order to formulate a flexible lead time model, various assumptions are made: scalability assumption plays a role in several but not all of our results. A model where shortage demand is lost as opposed to be backordered can be interesting. We assume no-order crossing and support this with numerical experiments (Du & Jiang, 2019). Lead time flexibility magnitude αis a given number, it could be an interval requiring the lead time to be modified to a number in $[T-\alpha, T+\alpha]$. Optimization of lot size can also be studied in more detail. In our transportation model, longer lead times leads to extra costs. It is conceivable that longer lead times are cheaper. We assume that the manufacturer uses frozen production schedule with JIT. Moreover,

we sequentially optimize SC costs after noting that joint optimization can yield better SC cost savings. Dealing with each of these issues and assumptions will yield a venue for future research (Ominde et al.,2022).

Supply chain management focuses on the coordination of activities across a chain of companies ordered in a number of echelons and can be addressed from a number of different perspectives. This research is focused on lead time distributions and their importance for supply chain management and describing actual lead time behavior (Du & Jiang, 2019). Moreover, the focus of the research is on how knowing your lead time behavior (and identifying how it is different from your expectations) can lead to changes in the supply chain setup and lead to a changed focus in a manufacturing company's planning and control approach. The remainder of the paper is structured as follows. First, a literature review of lead times in the context of supply chain management is presented (Yang & Zhang, 2019).

This includes a motivation from a mathematical perspective of why lead time distributions are critical, in some contexts more so than demand distributions (Du & Jiang, 2019). Second, a method for identifying lead time distributions and lead time behavior in supply chain is presented. Third, a case study containing both actual lead time distribution analysis and managerial insight gained from the investigation is presented. Finally, general managerial implications from stochastic lead times and conclusions are presented. So why are lead time distributions and their behavior so relevant for planning & control? In both inventory and supply chain management lead time demand expectation and variance of the same are critical when determining order quantities, re-order points and managing the supply chain [2]. However, it is not always clear why both demand and lead time distributions are critical for both the behavior and performance of a supply chain (Ominde et al.,2022).

RESEARCH METHODOLOGY

This study used descriptive research design (Mugenda & Mugenda 2008). The target population is a subset of the general public identified as the targeted population was 182 respondents who comprised, procurement officer, finance officer, admin officer and production officer. It is the entire population chosen to serve as the objective audience. Purposive Random sampling is a technique used in qualitative research to select a specific group of individuals or units for analysis. Participants are chosen "on purpose," not randomly. It is also known as judgmental sampling or selective sampling. This is the sampling technique which will be used in this study. This study used both open and closed ended questionnaire. A questionnaire is a research instrument that consists of a set of questions or other types of prompts that aims to collect information from a respondent. A research questionnaire is typically a mix of close-ended questions and open-ended questions. The study used Statistical Package for Social Science (SPSS) version 28. The Results presentation should include the findings of your study and only the findings of your study. The findings include: Data is now presented in tables, charts, graphs, and other figures.

RESEARCH FINDINGS AND DISCUSSION

Out of 164 questionnaires that were circulated to the respondents, 139 of the respondents dully filled and retuned questionnaires: yielding a response of 90.8%. This was a very reliable response rate for the generalization of study findings is in line with Sharma (2018), states that a response rate of 70% and above is believed to be a reliable response rate. This was less 11 (10%) respondents who were pilot tested.

Descriptive Statistics

In this section, the study presents findings on Likert scale questions on the role of inventory management practices and performance of preference groups in Agro processing firms County, Kenya. The study specifically presents the effect of supply chain complexity, and long lead time on performance of preference groups in Agro processing firms County, Kenya. Respondents were asked to use a 5-point Likert scale where 5 (SA) = Strongly Agree, 4(A) = Agree, 3(UD) = undecided, 2 (D) = Disagree, and 1(SD) = Strongly Disagree. Results obtained were interpreted using means and standard deviations where a mean value of 1-1.4 was interpreted as strongly disagree, 1.5-2.4 disagree, 2.5-3.4 neutral, 3.5-4.4 agree and 4.5-5 strongly agree.

Supply Chain Complexity

Respondents were requested to give their responses in regard to Supply chain complexity in a five point Likert sale where SA=Strongly Agree, A=Agree, N= Neutral, D=Disagree, and SD= Strongly Disagree. Results obtained were presented in Table 1 below. Respondents were requested to give their opinion on the variable Supply chain complexity. From table 4.7, the respondents unanimously agreement that Supply chain complexity ensured performance of and periodic review in Agro processing firms in Nairobi city County, Kenya viable (M=3.741, SD=1.0601); Through SC complexity s assessment the in Nairobi city County, Kenya has been able to make rational decisions on priority and non-priority projects (M=3.833, SD=.9202); willingness to electronic email assessment has contribution to the quality and innovation of the planning team (M=3.903, SD=.9007); electronic data interchange of quick, frequent and accurate of Supply chain complexity and it is important to put in place and maintain agro processing firms in Nairobi county, Kenya (M=4.060, SD=. 13950); The management of Agro processing firms in Nairobi city County, Kenya implements performance of to prevent fraud in supplier evaluation (M=3.841, SD=1.3020); and Supply chain complexity enhances performance of at Agro processing firms in Nairobi city County, Kenya(M=3.565, SD=.8016). These outcomes concur with the discoveries of Nyile *et al.* (2022) who observed that clear description of Supply chain complexity, can enhance effective performance of agro firms in Nairobi city County.

Table 1: Supply chain complexity

Statement	Mean	SD.
Agro in Nairobi city County, Kenya ensures online Implementation of supply chain complexity in the county	3.3741	1.060
Supply chain complexity in Nairobi city County, Kenya has e-notices on performance of agro in Nairobi city County	3.833	.9202
Supply chain complexity has contribution to performance of firms County	3.903	.900
supply chain complexity Towards better performances of agro of agro in Nairobi city County,	4.060	.7950
Enhance good performance	3.841	1.3020
Supply chain complexity enhances performance of agro firms in Nairobi city County	3.565	.8016

Long Lead Time

Respondents were asked to give their responses in regard to Long lead time on performance of Agro processing firms in Nairobi city County, Kenya i.e. 5 point likert sale where SA=Strongly Agree, A=Agree, N= Neutral, D=Disagree, and SD= Strongly Disagree. Their responses are presented in table 2 below:

From table 2, respondents, respondents agreed that Innovative Activities ensure performance of Agro processing firms in Nairobi city County, Kenya (M=4.039, SD=.7306); reduced costs activities on performance of Agro processing firms in Nairobi city County, Kenya (M=4.004, SD=.8306); Nairobi city County, Kenya ensures value for money on performance of Agro processing firms in Nairobi city County, Kenya (M=4.207, SD=.8506); profitability towards the embrace it towards better performance of Agro processing firms in Nairobi city County, Kenya t (M=4.010, SD=.8072); customer satisfaction reaction process contributes to performance of Agro processing firms in Nairobi city County, Kenya (M=3.926, SD=.8305); and to enhance dispute resolution results, our in Nairobi city County, Kenya has reacted a conducive supplier dispute resolution towards performance of Agro processing firms in Nairobi city County, Kenya(M=4.108, .8054).

These results are in agreement with the result of Nyile *et al.* (2022) who observed that the characteristic of long lead time are the best value reaction to sort out non-performance of, after long lead time, for resolving return on investment. The problem areas giving rise to disputes are mainly related to firms County's matters.

Table 2: **Long lead time**

Statement	**Mean**	**SD**
My in Nairobi city County, Kenya embrace performance of Agro processing firms in Nairobi city County, Kenya	4.037	.7304
My in Nairobi city County, Kenya embrace approval activities on performance of Agro processing firms in Nairobi city County, Kenya.	4.034	.8306
My in Nairobi city County, Kenya embrace on performance of Agro processing firms in Nairobi city County, Kenya	4.610	.7872
In cases of value for money disputes on performance of Agro processing firms in Nairobi city County, Kenya	3.926	.8305
Alternative value for money process on performance of Agro processing firms in Nairobi city County, Kenya	4.108	.8054
To enhance performance of Agro processing firms in Nairobi city County, Kenya	4.084	.8107

Performance of Agro Processing Firms

Respondents gave their level of agreement on various statements relating with performance of Agro processing firms in Nairobi city County, Kenya. The results were as presented in Table 3 below: From the findings, respondents were in agreement that performance of Agro processing firms in Nairobi city County, Kenya is being affect by supplier relationship management, they gave 63.2%; when asked about Value for money and its effect on procurement performance of Agro processing firms in Nairobi city County, Kenya they gave 70.7 %; When the respondents were asked to show their level of agreement on how complaints affects performance of Agro processing firms in Nairobi city County, Kenya they gave 9%; When also the respondents were asked to show their level of agreement on growth of the in Nairobi city County, Kenya government on performance of Agro processing firms in Nairobi city County, Kenya they gave 69.7%; Alternative dispute resolution process contributes to Supply chain collaborations on performance of Agro processing firms in Nairobi city County, Kenya they gave 42.5% and through contract management, operational performance measured by quality, flexibility, Supply chain collaborations on procurement performance of Agro processing firms in Nairobi city County, Kenya they gave 74.2%. The discoveries is in line with the discoveries of Mutai and Osoro (2021) they observed that some of the factors that contribute to inefficiency in public procurement as corruption, delayed payments, poor planning, statutory amendments, insufficient use supplier evaluation low public participation,

and improper payment procedures negatively affects performance of Agro processing firms in Nairobi city County, Kenya..

Table 3: Performance of Agro processing firms

Statements	**Yes (%)**	**No (%)**
Customer Satisfaction an affects performance of Agro processing firms in Nairobi city County, Kenya	52	48
Value for return an affects performance of Agro processing firms in Nairobi city County, Kenya	70.6	26.4
IT training an affect performance of Agro processing firms in Nairobi city County, Kenya	51	49
Return on investment an affects performance of Agro processing firms in Nairobi city County, Kenya	69.7	31.3
Quality of supplies an affects performance of Agro processing firms in Nairobi city County, Kenya	42.2	57.8
on performance of Agro processing firms in Nairobi city County, Kenya , Kenya	74.1	25.9

Pearson Correlation Analysis

The study further conducted inferential statistics entailing both Pearson and regression analysis with a view to determine both the nature and respective strengths of associations between the conceptualized predictors such as Supply chain complexity, and Long lead time and performance of Agro processing firms in Nairobi city County, Kenya.

Table 4: Correlation Coefficients

		Performance	Supply chain complexity	Long lead time
Performance Agro processing firms	Pearson correlation	1		
	Sig. (2-tailed)			
Supply chain complexity	Pearson correlation	.371*	1	
	N.	139*		
	Sig. (2-tailed)	.000		
Long lead time	Pearson correlation	.431*	.240	1
	N	139*	139	
	Sig. (2-tailed)	.000	.038	
			139	139

From the findings, a positive correlation is seen between each variable and performance. Long lead time and performance of firms County(r = 0.183). This is tandem with the outcomes of Ongeri and Osoro (2021), who observed that all independent variables were found to have a statistically significant association with the dependent variable at over 0.05 level of confidence.

Regression Analysis

To determine the relationship between the independent variables and the dependent variable and the respective strengths, the regression analysis produced coefficients of determination. Findings in table 5 reveal a positive relationship between the performances of Agro processing firms in Nairobi city County, Kenya,

Table 5: Regression coefficient Results

	Unstandardized coefficients		Standardized coefficients	T	Sig.
	B	Std. Error	Beta		
(constant)	-.134	.060	-1.144	.004	.003
Supply chain complexity	.471	.132	.858	5.472	.002
Long lead time.	.266	.115	.321	2.657	.003

b. Dependent Variable: performance of Agro processing firms in Nairobi city County, Kenya

A unit change in supply chain complexity led to a .471 effect on performance of Agro processing firms in Nairobi city County, Kenya sector ceteris paribus; while a unit change in long lead time would have an effect of .266 change in performance of Agro processing firms County. This outcome is in line with the results of Ongeri and Osoro (2021). This implies that among other factors, Supply chain complexity, and Long lead time are significant determinants of performance of Agro processing firms in Nairobi city County, Kenya.

Conclusion

Supply Chain Complexity

The study concludes that there is a positive relationship between Supply chain complexity and Performance of Speciation identification, periodic design assessment, continues improvement and proactive assessment are among the Supply chain complexity factors that significantly influenced the performance of Agro processing firms in Nairobi city County, Kenya. The study further concludes that by implementing Supply chain complexity has enhanced performance of Agro processing firms in Nairobi city County, Kenya, leading to operational increase in efficiency and effectiveness. Therefore, the study concludes Agro processing firms in Nairobi city County, Kenya has significantly increased their suppliers' quality management in the In Nairobi city County, Kenya government in the supply chain practices.

Long Lead Time

The study concludes that there is a positive relationship between Long lead time and performance of agro firms County. Partnership enforcement policy, collective bargaining, alternative dispute resolution processes, free expression of concerns by involved practices are among the coordination factors that significantly influenced the performance of Agro processing firms in Nairobi city County, Kenya. The study further concludes that by adopting alternative coordination and partnership mechanisms as it was observed at Agro processing firms in the level of performance of Agro processing firms has increased. Therefore, the study concludes that Agro processing firms in Nairobi city County, Kenya has been experiencing significant increase in service delivery through embracing proper coordination in the supply chain practices.

Recommendations

Supply Chain Complexity

The study recommend that Supply chain complexity formalizes relations between practices within a robust legal framework, but is much more besides; it is an opportunity to define the arrangements that encompass every aspect of what outcomes the Agro processing firms in Nairobi city County, Kenya wants from the supplier and how it wants the relationship to work. This means that the In Nairobi city County, Kenya needs to take an active role in the development of the quality mechanism early on; it should not be left as a supplementary activity post negotiation. At preparation of every quality management can contribute to supplier

evaluation on performance of Agro processing firms in Nairobi city County, Kenya. Proper Supply chain complexity can result to high procurement in firms County.

Long Lead Time

This study recommends that long lead time had a strong relationship with performance of Agro processing firms in Nairobi city County, Kenya. When relationship are not properly managed, they may cause supplier delays, undermine team spirit, increase delay costs, and, above all, damage business relationships. With the increase in the number of participants in a supplier management, it is obvious that more business interactions and arguments end up with an increase in the number of supplier relationship disputes. Research in preventing and resolving relationship disputes supports the effort for better understanding and harmonization of the different cultures. Therefore, this study recommends to the management of Agro processing firms in Nairobi city County, Kenya to enhance and upgrade on the implementation of all applicable alternative disputes resolution mechanisms so to protect relationship with its stakeholders in the supply chain practices.

Areas for Further Studies

This study focused on Supply chain complexity and long lead time and performance of Agro processing firms in Nairobi city County, Kenya. The study therefore recommends a further study to be conducted to other counties in Nairobi city County, Kenya. Then get their findings and compare with this and agree or disagree. The study also recommends replication of the study in other sectors such as manufacturing sector and public sector to allow comparison of research findings. Future researchers an investigate the factors affecting supply chain best practices broadly in all areas of concern in this profession on performance of the supply chain practices.

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