SUPPLY CHAIN SCALABILITY AND PERFORMANCE OF FOOD AND BEVERAGE MANUFACTURING FIRMS IN KENYA

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Supply Chain Scalability and Performance of Food and Beverage Manufacturing Firms in Kenya

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DECLARATION

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

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DEDICATION

This thesis is dedicated to my beloved wife, and the entire family for their support and guidance throughout this thesis.

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ABBREVIATIONS AND ACRONYMS

AGVs	Automated Guided Vehicles
ANOVA	Analysis of Variance
AST	Adaptive Structuration Theory
AVE	Average Variance Extracted
BM	Business Management
CFA	Confirmatory Factor Analysis
CMA2	Comprehensive Meta-Analysis Version 2
COVID-19	Coronavirus Disease 2019
DC	Distribution Center
EAC	East African Community
EDCL	Energy Development Corporation Limited
EFA	Exploratory Factor Analysis
ERP	Enterprise Resource Planning
FBMC	Food and Beverage Manufacturing Companies
FMCG	Fast-Moving Consumer Goods
FP	Firm Performance
FSCA	Firm's Supply Chain Agility

GDP	Gross Domestic Product
HODs	Heads of Departments
IDCZ	Industrial Development Corporation of Zimbabwe Limited
IPT	Information Processing Theory
IT	Information Technology
KAM	Kenya Association of Manufacturers
KEBS	Kenya Bureau of Standards
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KMO	Kaiser-Meyer-Olkin Measure
KNBS	Kenya National Bureau of Statistics
LANs	Local Area Networks
OEM	Original Equipment Manufacturer
OP	Operational Performance
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares Structural Equation Modeling
PPDPA	Public Procurement and Disposal of Public Assets
QA	Quality Assurance
QC	Quality Control

RBV	Resource-Based View
RFID	Radio Frequency Identification
RoK	Republic of Kenya
SC	Supply Chain
SCA	Supply Chain Agility
SCAF	Supply Chain Agility Factor
SCIPS	Supply Chain Performance Integration Measurement Scale
SCM	Supply Chain Management
SCS	Supply Chain Scalability
SMEs	Small and Medium-sized Enterprises
SPSS	Statistical Package for Social Sciences
TAM	Technology Acceptance Model
VIF	Variance Inflation Factor
VMI	Vendor-Managed Inventory

DEFINATION OF OPERATIONAL TERMS

Food and Beverage Manufacturing Firm This comprises of establishments that produce or process or manufacture raw food resources, foods in addition to beverages for human consumption along with other associated products (KAM, 2022). The establishments also grade, package and distribute the goods.

Lead-time Lead-time is the time or period taken from the moment the customer places an order to that moment the ordered product is delivered/ received by the customer (Siagian & Johono, 2022). It is the latency between initiation and execution of a process, and it is also the total amount of time required to complete a product from order receipt to shipment of the goods to customer. In the absence of finished goods or work in progress, it is the time it takes to actually manufacture the order without any inventory other than raw materials (Oliveira & Gonzalez, 2022).

Manufacturing firms A manufacturing firm is any business that uses components, parts or raw materials to make a finished good. These finished goods can be sold directly to consumers or to other manufacturing firms that use them for making a different product (Bandula & Kibria, 2023).

Supplier capability Suppliers' capacity to meet a lead firm's or buyer's needs, such as quality, timely delivery, and environmental and safety regulations (IGI, 2014)

Supplier collaboration By exchanging demand and supply forecasts with customers and suppliers across different tiers, Supplier Collaboration decreases supply chain unpredictability. Buyers can

communicate production plans, projections, commitments, and orders with suppliers, allowing providers to be more responsive when fulfilling demand requirements hundreds of kilometers away (Asamoah & Jacqueline, 2023).

Supply Chain Agility It indicates the speed with which a supply chain reacts to changes in the environment, consumer preferences, and competitive factors. It focuses on random deviations in supply chain operations on a day-to-day basis, defines how a company's supply chain responds to changes once the firm is aware of external events that may have a negative or positive impact on the organization's ability to achieve its goals (Usman, 2023).

Supply chain automation It refers to using technology to centrally manage a complicated web of functioning elements to systematize part or all of a workflow to improve supply chain procedures visibility. Businesses may profit from automating part or all of their supply chain by eliminating manual labor while enhancing productivity, efficiency, and accuracy (Mohsen, 2023).

Supply chain integration It is a perspective from a cross-enterprise to address resilience and sustainability, focus on the total value chain end-to-end transparency and customer need assessment require internal integration between departments, as well as integration of customers, suppliers, and third parties while discussing risks and possibilities (Zhang, Comite & Matac, 2022).

Supply chain Scalability It is a property of a system, model, or function that indicates its ability to cope with and operate well under a growing workload or scope. Even as it is put to the test by larger and larger operational demands, a system that scales well will be able to

maintain or even improve its level of performance or efficiency (Jean, 2024).

Value chain mapping It is a method that identifies the primary activities related with a distribution firm's service or product line, and it's frequently used in corporate planning to find ways to improve performance (Priyanka & Kandpal, 2022).

ABSTRACT

Sustainably high-performing firms create superior customer value while maintaining low operational costs. Achieving this requires continuous innovation and a deep understanding of internal business systems to navigate dynamic operating environments. Despite the apparent link between supply chain scalability and firm performance, limited empirical research has examined this relationship. Therefore, this study sought to investigate this critical connection. Thus, the main objective of the study was moderating effect of supplier capability on relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya. This study specifically determined the effects of supply chain agility on performance of food and beverage manufacturing firms in Kenya, determine the effect of supply chain integration on performance of food and beverage manufacturing firms in Kenya, determine the effect value chain mapping on performance of food and beverage manufacturing firms in Kenya, analyse the effect of supply chain automation on performance of food and beverage manufacturing firms in Kenya and determine the moderating effect supplier capability on relationship supply chain scalability on performance of food and beverage manufacturing firms in Kenya. The study was guided by Adaptive Structuration Theory, Information processing theory, Systems Theory, Theory of Technology Acceptance Model (TAM) and Dynamic Capabilities Theory. This study adopted positivism research philosophy, descriptive survey design and explanatory research design. The target population for this study comprised 544 heads and assistant heads from four key departments, supply chain and logistics, quality assurance and quality control, production/operations, and sales and marketing, across 68 food and beverage manufacturing firms in Kenya. Stratified random sampling technique was used to obtain 228 respondents from the food and beverage manufacturing firms in Kenya for the study. This study collected mainly primary data using a semi-structured questionnaire. Cronbach's Alpha was used to assess the reliability of the research instruments, while face validity, content validity, and construct validity were employed to establish the validity of the measurement scales. Data was analysed using both descriptive and inferential statistics with the aid of SPSS version 28. Descriptive statistics included mean, standard deviation, frequencies and percentages. Inferential statistics comprised of multiple regression model and hierarchical regression model. The study found that supply chain agility has a positive and significant effect on the performance of food and beverage manufacturing firms in Kenya (β=0.433, p-value= 0.000). In addition, the findings indicated that supply chain integration has a positive and significant effect on the performance of food and beverage manufacturing firms in Kenya (β=0.497, p-value= 0.000). Moreover, the study found that value chain mapping has a strong positive and significant relationship with performance of food and beverage manufacturing firms in Kenya (β=0.469, p-value= 0.000). Further, the study found that supply chain automation has a positive and significant relationship with performance of food and beverage manufacturing firms in Kenya (β=0.411, p-value= 0.000). Also, the study found that supplier capability has a moderating effect on the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya (β=0.283, p-value= 0.000). The study recommends that food and beverage

manufacturing firms in Kenya enhance supply chain agility, integration, automation, and value chain mapping while developing strong supplier capabilities through strategic partnerships, digital integration, and knowledge sharing to improve operational efficiency, responsiveness, and overall firm performance.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Manufacturing companies must enhance performance to keep pace with rapid technological change, evolving consumer demands, and intensifying global competition. In today's dynamic business environment, firms can leverage scalability and advanced technologies to strengthen efficiency and sustain competitive advantage (Rajagopal & Sulaiman, 2019). A firm achieves superior performance when it creates greater economic value than its marginal or breakeven competitors. Sustaining this advantage requires product scalability and the adoption of collaborative practices that integrate suppliers and customers into decision-making processes while promoting information sharing across the supply chain (Bhimani & Ncube, 2016). However, achieving continuous performance that guarantees long-term survival remains a significant challenge, particularly for small and medium-sized enterprises. Smaller firms often face greater vulnerability in hostile and uncertain markets compared to larger organizations, making strategic adaptability and operational efficiency critical for sustained success (Zhao & Chen, 2023).

Scalability refers to the ability of a system, network, or process to handle increasing workloads or expand efficiently without compromising performance (Jokipii, 2025). It describes how well a system, model, or function continues to operate effectively as operational demands grow (Barahona & Elizondo, 2014). In the context of globalization and technological advancement, scalability has become increasingly important, particularly in supply chain integration and embedded decision-making models supported by modern information systems (Bhimani & Ncube, 2016). A well-scaled system maintains or even improves efficiency and distribution performance despite rising operational pressures (Hellani & Exposito, 2021). Scalability is closely linked to economies of scale, where increased production leads to lower average costs and higher profitability. Thus, scalable systems enable firms to grow sustainably while preserving

efficiency, competitiveness, and overall organizational performance in dynamic business environments.

Firms operating in uncertain and highly competitive environments must respond rapidly to changing customer needs, making logistics flexibility a critical capability. Failure to meet customer expectations can quickly erode loyalty (Oshilalu, 2024). As customers increasingly demand personalized design, production, and delivery, firms must prioritize supply chain flexibility rather than focusing solely on equipment or process adjustments (Zhao & Chen, 2023). Logistics flexibility refers to a firm's ability to respond swiftly and efficiently to evolving demands in inbound and outbound delivery, support, and related services. It enables companies to react to actual demand rather than relying only on forecasts. Key activities include coordinating shipments, supporting manufacturing, and sharing information across the supply chain. By delaying commitment and adapting to change, firms can fine-tune delivery to meet specific customer requirements. This flexibility is strengthened by a market-oriented strategy that promotes collaboration, efficiency, and reliability throughout the supply chain (Karikari, 2016).

A scalable supply chain consists of interconnected supply, production, and distribution networks that must manage uncertainties such as fluctuating demand, supplier lead times, product quality variations, and information delays. Flexibility enables firms to shift production across plants and suppliers, helping management address both internal and external variability (Rajagopal & Sulaiman, 2019). In manufacturing, logistics serves as a key source of competitive advantage because material flows significantly influence overall business performance (Oshilalu, 2024). During crises such as demand surges, firms rely on alternative logistics routes, making production allocation and transportation planning critical decisions that affect performance outcomes. Flexibility expands operational options, enhances responsiveness, and ensures performance consistency. A firm's range, its ability to design, produce, and market diverse products, also reflects scalability. High range exists when product variety and differentiation are substantial, strengthening competitiveness and adaptability in dynamic markets (Adhiambo & Osoro, 2024).

When a company can swiftly switch between a large number of different goods while maintaining performance criteria, scalability in supply chain process management becomes even more important. The ability to retain high quality as the product changes is implied by high uniformity (Sriram & Stump, 2012). The supply strategy affects the logistics performance of a supply chain: for example, components can be provided to a production plant from a local and/or distant provider, as well as by single double, or multiple sourcing (Khor & Zulqarnain, 2023). The vital function of the component or the logistics complexity, for example, influence supply plan selection (for instance, commodity parts and big components are usually provided by local suppliers). In a scalable supply chain, different distribution and procurement strategies are taken into account; each assembler can buy what they need (Tynjala, 2012).

The growing uncertainties of the business operating environment prompted by widespread globalization that increases competition and advancements in technology that increases the ease of access to production information while reducing the costs of acquiring production equipment are forcing companies to rethink the strategic development (Shao & Li, 2022). In addition, the increasing ease of imitating products leaves companies' supply chain scalability as the only sustainable source of developing practical competitive advantages. Supply chain scalability does more than just reduce their costs of production and increase their productivity, it also reduces their logistics problems by ensuring materials and products deliveries adhere to just-in-time principles.

When it comes to developing capabilities and plans for sustaining operations and market success, supply chain scalability has become the new pre-requisite for a company's existence (Jean, 2024). Supply chain scalability is crucial for gaining a competitive advantage in the market, controlling various types of supply chain risks (Ranaiefar & Ritchie, 2023), and predicting various types of uncertainties in the surrounding environment (Khor & Zulqarnain, 2023). Because the external environmental factors are changing rapidly, the research focus will not only be supply chain but also information integration and trust relationship among the manufacturing partners within a supply chain and a lot of attention to the relationship between the Supply chain scalability and their

firm performance. However, their role in developing supply chain scalability was never explored.

A scalable supply chain possesses the flexibility and adaptability to accommodate fluctuations in demand, changes in market conditions, and unexpected disruptions, thereby enhancing the overall agility and responsiveness of the organization (Wanje & Lambaino, 2023). When a company's supply chain is scalable, it can efficiently adjust its production, distribution, and inventory management processes to meet varying levels of demand without incurring significant additional costs or delays (Kankam & Dza, 2023). This ability to scale operations up or down as needed enables organizations to optimize resource utilization, minimize waste, and maintain optimal levels of inventory, leading to improved operational efficiency and cost-effectiveness (Usman, 2023).

A scalable supply chain directly enhances organizational performance by enabling firms to exploit growth opportunities and manage market uncertainties effectively (Jermsittiparsert, 2022). As companies expand into new markets or introduce new products, scalability provides the infrastructure and capabilities needed to support seamless operations. Efficient management of goods and information flows across the supply chain improves customer satisfaction, shortens lead times, and strengthens market share. Additionally, scalable supply chains improve resilience by helping firms mitigate risks arising from disruptions such as natural disasters, geopolitical tensions, or supplier failures, thereby ensuring operational continuity (Hsieh, 2019). This adaptability reduces potential losses and supports sustained performance. Overall, the strong link between supply chain scalability and organizational performance highlights the strategic role of effective supply chain management in fostering sustainable growth, competitiveness, and long-term success (Al-Maaitah, 2024).

1.1.1 Global Perspective on Supply Chain Scalability

Scalability is essential for both short- and long-term business success in an increasingly globalized economy (Jean, 2024). Although research on supply chain scalability is still

emerging, it highlights scalability as a strategic capability that enables seamless integration among suppliers, manufacturers, distributors, and customers to enhance operational efficiency (Khan et al., 2021). Key benefits include reduced costs and lead times, improved flexibility, and the development of innovative operating strategies (Hsieh, 2019). Studies also identify knowledge, technology, and relationship networks as critical enablers of scalable supply chains (Oluwagbade & Odumbo, 2025). Evidence shows that scalable systems can accelerate technology adoption and improve efficiency, as demonstrated in international organizations and manufacturing contexts (Hultberg & Pal, 2021). Furthermore, scalability supports new product and service development, process optimization, and scenario modeling, strengthening competitiveness and performance in dynamic markets (Yenugula & Goswami, 2023; Litke & Varvarigou, 2019).

Supply Chain Scalability (SCS) is defined as a change (incremental or radical) within the supply chain network, supply chain technology, or supply chain processes (or combinations of these) that can occur in a company function, within a company, in an industry, or in a supply chain in order to enhance new value creation for stakeholders, according to research from countries such as the United States, Denmark, and Germany (Yenugula & Goswami, 2023). According to Sutradhar et al. (2025), supply chain (SC) scalability assists firms in achieving efficiency and quality management techniques for new customer value creation, resulting in increased organizational performance. Supply chain scalability is defined in Malaysia as "the system by which companies reconfigure and integrate their internal and external structures/processes, infrastructure/human ware with the goal of sensing and seizing new opportunities that facilitate information management, sourcing, production, and delivery of products to the end-consumer in a responsive, cost-effective, and timely manner" (Sharma, Vaid & Saini, 2023).

Scalability and its magnitude have been found to be significantly associated with firm performance, as evidenced in studies conducted in Russia (Aldoubaee & Rahim, 2023). Similarly, research in Malaysia shows that effective supply chain strategies enhance scalability and improve overall organizational performance (Mertens et al, 2024). In

China, supply chain scalability has been linked to reduced operational costs, shorter lead times, improved product quality, and greater visibility and flexibility in responding to rapid shifts in consumer demand (Azzaoui, 2021). These findings collectively demonstrate that scalable supply chains strengthen efficiency, responsiveness, and competitiveness, ultimately contributing to improved firm performance across diverse economic contexts.

In Mexico, supply capability has been shown to foster continuous scalability within the supply chain, particularly through collaborative planning, knowledge sharing, logistical process integration, and joint investments (Mejía et al., 2025). Research from Finland also emphasizes that scalability remains underexplored in supply chain studies, yet requires strong organizational commitment, anticipation of customer needs, and both intra- and inter-organizational learning (Oshilalu, 2024). These elements enable firms to recognize and respond effectively to evolving market expectations. From a practical perspective, effective supply chain scalability enhances firm performance and market share (Mertens et al, 2024). It improves customer value by reducing costs and enabling delivery solutions tailored precisely to customer requirements. Logistics managers further acknowledge that scalability strengthens operational output and overall competitiveness by increasing efficiency and responsiveness (Lejarza & Baldea, 2021).

Supply chain scalability has been shown to reduce operational costs and lead times, enhance operational strategies, improve quality, and provide flexibility to respond to rapid changes in consumer demand, as demonstrated in China (Rao & Memon, 2024). However, these studies face several integrative limitations, highlighting the need for broader practical research. Collaboration and competencies between buyers and sellers have been identified as key drivers of scalability (Attah & Iwuanyanwu, 2024). Yet, much of the existing research approaches the concept narrowly, indicating that more comprehensive empirical studies are required (Bhat et al., 2021). Additionally, operational procedures, information systems, and managerial processes significantly enhance supply chain performance (Attaran, 2020). Therefore, integrating technology, collaboration, top

management support, and scaling capabilities is crucial for improving manufacturing firms' operational efficiency and overall performance.

Mohammad and Feng (2025) examined the role of information technology in enhancing supply chain scalability in the Jordanian textile industry. Their applied study demonstrated how IT adoption enables organizations to design effective roadmaps for implementing technologies that maximize supply chain scalability. With the growth of the global economy and rapid advances in information systems, IT has become a critical component of supply chain management, prompting firms to transform business operations. As companies increasingly emphasize high levels of customer service, product flexibility, and volume flexibility, supply chain integration must efficiently manage high-mix, low-volume products with diverse features, options, sizes, and colors (Khor & Zulqarnain, 2023). This highlights the importance of leveraging IT to improve responsiveness, efficiency, and adaptability in dynamic and complex supply chain environments.

1.1.2 Regional Perspective on Supply Chain Scalability

In Nigeria, Adeniyi and Adeeko (2024) research shed light on the intricate relationship between supply chain scalability and supply chain performance. The study indicated that a well-integrated supply chain, supported by collaborative processes and top management endorsement, plays a pivotal role in enhancing firm performance. By emphasizing the importance of scalability capability as a critical indicator of supply chain scalability, the study underscored the significance of adaptability and flexibility within the supply chain framework. Scalability capability enables organizations to adjust and expand their operations in response to changes in demand, market conditions, or business requirements, ensuring resilience and agility in the face of dynamic challenges. It highlight the interdependence between supply chain scalability and firm performance, suggesting that investments in scalable supply chain processes and capabilities can yield substantial benefits for organizations operating in the Nigerian context.

In Egypt, Abdelmasih and Youssef (2025) observed that the implementation of supply chain scalability has an influence on performance of manufacturing firms. However, despite recognizing the potential benefits of scalable supply chain processes, the study revealed that many manufacturing firms in Egypt struggled to effectively implement and leverage scalability capabilities to improve their performance. This discrepancy could be attributed to various factors such as organizational barriers, resource constraints, and a lack of awareness or understanding of the importance of supply chain scalability among key stakeholders within these firms. In addition, challenges that hinder the creation of technological competencies necessary for implementing supply chain scalability initiatives in manufacturing firms in Egypt include the high cost of technology adoption and implementation, which may pose financial barriers for firms with limited resources. Additionally, weak corporate culture for technology, technological uncertainties, and paradoxes can impede firms' ability to effectively integrate scalable technologies into their supply chain operations.

In Ghana, Kwatia and Obiri-Yeboah (2026) observed that supply chain partner scalability and product scalability strategy had an influence on supply chain management. Supply chain partner scalability played a significant role in shaping firms' decisions regarding product scalability strategies. The study shed light on the interconnectedness of supply chain dynamics and strategic decision-making. It showed the importance of considering the scalability capabilities of supply chain partners when formulating and implementing product scalability strategies, as the ability of partners to scale their operations can significantly impact the overall effectiveness and efficiency of the supply chain. The study found that firms with stronger strategic relationships with key supply chain partners were better positioned to leverage partner scalability to enhance their own scalability strategies. These strategic relationships fostered greater collaboration, communication, and alignment of goals and objectives between firms and their partners, enabling them to more effectively coordinate their efforts and respond to scalability challenges and opportunities in the marketplace.

Supply chain management is the planning, organizing, and controlling of activities inside and outside an organization that enable the value chain to make products and provide services to the customer (Abogro & Korang, 2024). Recently, two classes of software systems, enterprise resource planning (ERP) systems and supply chain management (SCM) systems, have been broadly adopted for managing supply chains. The "traditional" overall objective of ERP systems is to provide an integrated transaction processing fabric inside an organization. This enhances organizational performance by providing broader information availability, reducing information inconsistency and improving transaction-processing efficiency (Yenugula & Goswami, 2023). The implementation of an ERP requires that many business processes be organized, documented and, to a degree, standardized. In many cases, benefits also accrue directly from these activities. SCM systems, on the other hand, are aimed at providing a higher level of decision support related to activities that involve the coordination and control of inter-organizational production and distribution processes.

With the shifting focus of supply chain managers from a plant, a warehouse or a company to multiple companies and their interactions, standalone ERP and SCM systems are incapable of supporting today's business dynamics. ERP and SCM systems are generally maturing their capabilities and their features have begun to overlap. A class of reliable, cost-effective and synchronized ERP and SCM systems becomes vital for today's business in order to better support complicated internal players and collaborate with trading partners along the total supply chain. We collectively refer to such systems, as well as closely related systems and tools, as supply chain infrastructures (SCls). In fact, the SCls have been one of the fastest growing trends in business today. Some studies have indicated that as much as 50% to 60% of the potential benefits from effective supply chain management may not be achieved without this integrated infrastructure (Abogro & Korang, 2024).

1.1.3 Local Perspective on Supply Chain Scalability

Humanitarian organizations are involved in supply chain scalability in Kenya. Some of the supply chain scalability indulged in most include are enterprise resources planning, use mobile computers, wireless LANs and distribution network optimization and least supply chain scalability adopted were Bokode, wave picking and pick by voice technology (Nyaga, Noor & Nteere, 2021).

Seacon Kenya Ltd is a transit and transport company providing freight forwarding, customs clearing, petroleum and bulk cargo transport, motor cargo, and project cargo handling. The company has developed a scalable supply chain that delivers the right level of logistics support according to customer needs. Its logistics services are flexible and can be customized to meet specific business requirements. With extensive experience in transporting goods across East Africa, Seacon Kenya Ltd serves markets in Kenya, Uganda, and Tanzania, leveraging the East African Community (EAC) framework to enhance regional trade and commerce (Adhiambo & Osoro, 2024). This combination of scalability, flexibility, and regional expertise allows the company to efficiently meet diverse customer demands while supporting cross-border trade growth.

Cipro Logistics, a global transport company with a branch in Mombasa, Kenya, provides services including international freight forwarding, customs clearance, logistics management, inland container depot management, and warehousing. To streamline logistics, businesses are increasingly adopting Distribution Center Bypass (DC Bypass), which allows shipments to move directly from the manufacturing site or entry point to the end user, reducing unnecessary stopovers and wasted mileage (Kamau, 2013). Cipro Logistics recognized that standard supply chains involving distribution center stops could be inefficient, and by eliminating these stops, carriers can improve inventory and route management. This approach enables manufacturers with distributed supply chains to collaborate more effectively with logistics providers, responding efficiently to weather or other disruptions. As real-time data management becomes more accessible and cost-effective, enterprises can integrate technology into business processes, combining data

movement, access, analysis, and execution to enhance supply chain efficiency and problem-solving capabilities (Manyega, 2015).

Mwaura and Noor (2025) highlight how humanitarian organizations in Kenya engage in supply chain scalability initiatives. Key strategies adopted include enterprise resource planning, mobile computing, wireless LANs, and distribution network optimization. However, some advanced scalability techniques, such as Bokode, wave picking, and pick-by-voice technology, are less commonly implemented. This variation illustrates the diverse range of scalability practices within the sector. The preference for certain measures over others likely reflects considerations of cost, technological feasibility, and alignment with organizational goals and operational needs, emphasizing the practical challenges and strategic choices faced by humanitarian organizations in enhancing supply chain performance.

Manufacturing firms play a very concrete and significant role when it comes to contributing to the overall economy of a country. This mainly brings about a 12.5 % export, 13% formal employment, and a 10% gross domestic product (Mwaiwa, 2024). Manufacturing in Kenya's contribution to the economy has stagnated at around 10% of the Gross Domestic Product (GDP). This is according to the Kenya Association of Manufacturers (KAM) report on manufacturing in Kenya under the Big 4 Agenda, (2018). Government Big 4 Agenda seeks to increase the GDP contribution of the sector to 15% by 2022.

According to this agenda, the Kenyan government is working towards being in stride with the fourth industrial revolution. The revolution perceived as the future of manufacturing is driven by the ongoing automation of traditional manufacturing industrial practices and using modern smart technology (Manyega, 2015). However, for supply chain management to be more successful, components such as supply chain scalability must be adopted for the company to deal with increased demand caused by either long-term growth or seasonal surges (Mwaiwa, (2024). In today's economic environment, companies must adopt strategies that allow them to produce high-quality products in a short amount of

time (Wakoli & Wachiuri, 2025). A manufacturing company's success will be determined in large part by how well it has developed innovative supply chain management strategies that will allow it to maintain a competitive advantage regularly (Miriti & Nteere, 2025).

When it comes to working on the SCS of a firm, various factors have to be considered. This mainly includes the business targets as most recommendations are inclined to target its internal operations. On the other hand, aspects such as knowing the business's supply partners go a long way in shaping the firms' scalability, and this flexibility influences the firms' manufacturing process. The supply chain mainly plays the vital role of connecting finished components, parts, and raw materials in a bid to accomplish a common whole in manufacturing (Mwaiwa, 2024). Companies that have embraced current and modern means of SCM as part of their plan when it comes to business management (BM) are at a higher chance of having a competitive edge over their counterparts who are not flexible enough and are yet to embrace the current trends (Adhiambo & Osoro, 2024).

Among distribution firms in Kenya, Ocharo and Noor's (2020) shed light on the intricate relationship between supply chain scalability measures and the performance. The findings show a significant impact of supply chain agility and supply chain integration on the performance outcomes of distribution firms operating within the Kenyan market. For instance, supply chain agility, which refers to the ability to respond quickly and effectively to changes in market conditions or customer demands, is crucial for distribution firms in Kenya to adapt to dynamic environments and maintain a competitive edge. Examples of supply chain agility measures adopted by distribution firms in Kenya include flexible transportation arrangements, dynamic inventory management systems, and responsive order fulfillment processes. In addition, examples of supply chain integration initiatives include the integration of information technology systems to enable real-time data sharing and communication among supply chain partners, as well as the establishment of strategic partnerships and alliances to enhance coordination and resource sharing.

Nyaga, Noor and Nteere (2021) show the crucial relationship between order fulfillment scalability and performance outcomes. It shows the significant impact of order fulfillment

scalability on the performance of manufacturing firms operating within Nairobi County. In dynamic urban environments like Nairobi County, efficient and scalable order fulfillment processes are essential for meeting customer demands promptly and maintaining competitiveness in the market. Examples of scalable order fulfillment practices observed among manufacturing firms in Nairobi may include the implementation of automated inventory management systems, flexible production scheduling, and agile distribution networks. Effective order fulfillment not only ensures timely delivery of products to customers but also influences upstream procurement processes, such as inventory management and supplier relations.

1.1.4 Performance of Food and Beverages Manufacturing Firms in Kenya

The Kenya Association of Manufacturers (KAM), (2018), states that food and beverage is the largest sector out of the 14 sectors within its membership and constitutes 22 per cent of total KAM membership. The sub-sectors under this include, Alcoholic Beverages & Spirits, Bakers & Millers, Cocoa, Chocolate and Sugar Confectionery, Dairy Products, Juices, Waters and Carbonated Soft Drinks, Slaughtering, Preparation and Preservation of Meat, Tobacco and Vegetable Oils. The FBMF sub sector in manufacturing sector contributes about 10 percent of the Gross Domestic Product (GDP) (Miriti & Nteere, 2025).

The Kenyan food-processing sector remains the largest component of the manufacturing industry in terms of structure, economic contributions, and performance within the manufacturing sector (Odedo & Noor, 2024). However, according to the Kenya National Bureau of Statistics (KNBS, 2009), the sector is contracting despite the fact that it still generates over a third (33.4 per cent) of the total manufacturing production, and provides 89,319 jobs. The abstract blames the contraction on 2 high production and ingredient costs. With these and many other challenges the companies need to evaluate their suppliers (Odedo & Noor, 2024)

Thus, Performance improvement of (Food and Beverages Manufacturing Firms) FBMF in Kenya is vital to the fiscal growth of the country as this will ensure increased incomes and employment to the rural population (KIPPRA, 2017). It is on this premise that factories performance continues being a key priority to the central regime of Kenya, procurement and supply management practitioners and Researchers. Despite of previous inquiries on the liaison of tactical coalitions and performance in FBMC, the connections of the variables still remains an area of interest as there is lack of consensus among scholars on how this concept are connected.

Performance is generally an achievement of a given pre-set goals through the undertaking certain tasks within established by an individual or an institution (Kenya National Bureau of Statistics, 2009). Firm performance, therefore, comprises the actual output or results of an organization as measured against its intended outputs (or goals and objectives). Wakoli and Wachiuri (2025) argues that organizational performance comprises three explicit areas of firm outcomes: financial performance (profits, return on assets, return on investment, etc.); product market performance (sales, market share, etc.); and shareholder return (total shareholder return, economic value-added, etc.). According to Wakoli and Wachiuri (2025) organization performance can be measured through profitability, customer satisfaction and market share. This study seeks to establish the influence of procurement transformation process on performance of food and beverage industry in Nairobi City County Kenya.

The food and beverage industry is among the largest sectors and constitutes 22 percent of total KAM membership, the sub-sectors under this includes; dairy products, alcoholic beverages, spirits, juices, bakers & millers, water, cocoa, carbonated soft drinks, chocolate &sugar. Food processing entails the transformation of raw ingredients into food or transformation of food into other forms that can be consumed by humans or animals. Traditionally food processing was meant to make food more digestible and preserve food during times of scarcity. Food processing typically takes clean, harvested crops or butchered animal products and uses these to produce attractive, marketable and often long shelf life food products (Njuguna & Osoro, 2023).

The food and beverage industry in Kenya has been experiencing a lot of turbulence in the recent past including a drop in the GDP, an increasing imbalance of trade and the exiting of large multinationals (Nyaoga, Magutu & Aduda 2015). Therefore, proper analysis and improvements in the procurement processs would lead to greater benefits. The management of a value stream would result in improved service, growth in market share, suppliers and distribution channels and provides invaluable analytics for continuous improvement.

Kis and Shah (2019) examined supplier integration and the performance of manufacturing firms in Nairobi County, finding that customer integration significantly enhances performance through information sharing, product development, and demand planning. Supplier integration positively influences performance by promoting product innovativeness, supplier participation, and better coordination of operations, while internal integration showed a negative and insignificant effect. Similarly, Chebichii, Namusonge, and Makokha (2021) found that supplier integration positively affects the performance of food and beverage manufacturing companies in Kenya by improving quality, reducing risks such as supply failures or poor product quality, and shortening lead times. Overall, supply chain integration enhances firm performance: internal integration fosters teamwork, resource sharing, and effective communication; supplier integration improves quality, joint product development, and agility; and customer integration drives customer-centric collaboration, co-development, and innovation in new products (Adhiambo & Osoro, 2024).

1.2 Statement of the Problem

The Kenyan food and beverage industry faces increasing environmental, health, and safety pressures due to the growing impact of its logistics operations (Muthoni & Mose, 2020). Rapid and continuous expansion in production and distribution has exposed weaknesses in supply chain practices, particularly in scalability and resource management. Many firms rely heavily on non-environmentally friendly packaging, inefficient transportation, and poorly coordinated warehousing systems, which not only harm the environment but also

increase operational costs and reduce overall efficiency (Ngatia, Osoro & Nyang'au, 2024). Excessive energy consumption in transportation and storage, combined with poorly integrated supply chains, limits the ability of firms to scale operations efficiently, affecting responsiveness to growing market demand and reducing profitability. These issues have persisted over the last decade in food and beverage manufacturing firms across Kenya, particularly in Nairobi County, which hosts a high concentration of these firms. Manufacturers, suppliers, retailers, and consumers are all affected as operational inefficiencies result in higher costs, inconsistent product quality, and delayed delivery.

The sector has also experienced declining economic performance. The Kenyan food and beverage manufacturing sector contributed only 9.2% to GDP in 2016, down from 13.6% in the early 1990s, while sector growth slowed from 3.4% in 2017 to 3.1% in 2018 (KNBS, 2019). The decline signals inefficient operations and poor competitiveness. Quality and safety issues further compound the problem: aflatoxin compliance among millers dropped from 91.8% in 2021 to 62.2% in 2024, exposing consumers to health risks. Additionally, only about 35% of large beverage manufacturers have adopted advanced automation technologies, contributing to below-benchmark production efficiency and inconsistent product quality (Odera & Noor, 2024). These inefficiencies demonstrate that inadequate supply chain scalability directly affects product quality, food safety compliance, and operational efficiency.

Several studies have examined supply chain scalability and firm performance in Kenyan manufacturing, including Odedo and Noor (2024), who focused on distribution firms in Nairobi City County; Wakoli and Wachiuri (2025), who assessed supply chain scalability in distribution firms; and Nyaga et al. (2021), who investigated order fulfillment scalability on large manufacturing firms in Nairobi. These studies exhibit several gaps. Methodologically, they used cross-sectional and descriptive research designs that do not establish cause-and-effect relationships. Conceptually, they focused narrowly on warehouse flexibility, supplier networks, and order fulfillment, neglecting other critical dimensions such as supply chain automation, integration, value chain mapping, and agility. They also failed to examine the moderating effect of supplier capability on

performance. Contextually, these studies were limited to distribution and large manufacturing firms in Nairobi, making it difficult to generalize findings to food and beverage manufacturing firms across Kenya. Without understanding the role of supply chain scalability in enhancing performance, firms remain unable to address operational inefficiencies, improve product quality, ensure food safety compliance, or increase production efficiency. This study therefore addresses these gaps by investigating how supply chain scalability affect firm performance in food and beverage manufacturing firms in Nairobi County and the moderating effect of supplier capability.

1.3 Research Objectives

1.3.1 General Objective

The general objective of the study is to examine the effect of supply chain scalability on performance of food and beverage manufacturing firms in Kenya

1.3.2 Specific Objectives

The study was guided by the following specific objectives:

1. To determine the effect of supply chain agility on performance of food and beverage manufacturing firms in Kenya.
2. To assess the effect of supply chain integration on performance of food and beverage manufacturing firms in Kenya.
3. To evaluate the effect of value chain mapping on performance of food and beverage manufacturing firms in Kenya.
4. To analyze the effect of supply chain automation on performance of food and beverage manufacturing firms in Kenya.
5. To determine the moderating effect of supplier capability on the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya.

1.4 Research Hypothesis

The study tested the following hypotheses:

$H_{01:}$ There is no significant effect of supply chain agility on performance of food and beverage manufacturing firms in Kenya

$H_{02:}$ There is no significant effect of supply chain integration on performance of food and beverage manufacturing firms in Kenya

$H_{03:}$ There is no significant effect of value chain mapping on performance of food and beverage manufacturing firms in Kenya

$H_{04:}$ There is no significant effect of supply chain automation on performance of food and beverage manufacturing firms in Kenya

$H_{05a:}$ There is no significant moderating effect of supplier capability on relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya.

1.5 Significance of the Study

The findings of this study are important to a number of stakeholders including: managers in county Governments, Food and beverage manufacturing firms, clearing and forwarding firms, third party logistics providers, Future scholars and researchers and the Food and beverage manufacturing firms in Kenya in formulation, implementation and enforcement of Supply Chain Scalability strategies.

1.5.1 Food and Beverage Manufacturing Firms in Kenya

The study is particularly valuable to food and beverage manufacturing firms, including those not directly covered in the research, by providing actionable insights for improving supply chain scalability. It guides management in identifying and implementing the most

effective supply chain strategies to enhance operational efficiency, product quality, and responsiveness to market demands. Additionally, the findings serve as a benchmarking tool, enabling firms to evaluate their current practices, understand the impact of supply chain scalability on performance, and make informed decisions that strengthen competitiveness, reduce costs, and support sustainable growth in Kenya's dynamic manufacturing sector.

1.5.2 Supply Chain Professionals and Practitioners

The findings of this study provide valuable insights for supply chain managers, logistics practitioners, and advisory experts by highlighting effective strategies for enhancing supply chain scalability and performance. Leadership in the supply chain acts as the driving force of an organization, providing direction, vision, and strategic energy, while supply chain processes translate these inputs into tangible outcomes such as efficiency, timely delivery, and operational effectiveness. By understanding the interplay between leadership, scalability, and organizational performance, practitioners can implement best practices in resource management, coordination, and process optimization. This knowledge equips professionals to improve production efficiency, ensure consistent product quality, strengthen supplier collaboration, and enhance overall competitiveness in the food and beverage manufacturing sector.

1.5.3 Kenya Association of Manufacturers

The findings of this study are valuable to the Kenya Association of Manufacturers (KAM) in assessing competitiveness among food and beverage manufacturing firms in Kenya. The study provides insights into how supply chain scalability influences firm performance, contributing to overall industry efficiency, productivity, and competitiveness. KAM can use these findings to support member firms in aligning their operations with national development goals such as Vision 2030, while also understanding the sector's impact on GDP, employment, and economic growth. Additionally, the study identifies key performance indicators for monitoring and managing supply chain

scalability, offering practical tools for benchmarking, policy formulation, and strategic guidance for member organizations.

1.5.4 Government and Regulatory Bodies

The findings of this study provide valuable evidence to policymakers, government agencies, and regulatory bodies responsible for overseeing the food and beverage manufacturing sector. By highlighting the influence of supply chain scalability and supplier capability on firm performance, the study can inform the formulation and implementation of policies and regulations related to food safety, health standards, quality compliance, and operational efficiency. Moreover, the research offers practical guidance for promoting scalable, sustainable, and efficient supply chain practices that enhance industry competitiveness, support job creation, and contribute to economic diversification. Regulatory bodies can use these insights to design monitoring frameworks, establish performance benchmarks, and develop incentives that encourage firms to adopt best practices in logistics, production, and supplier management. Ultimately, this contributes to achieving national development objectives, including Kenya's Vision 2030 goals for industrial growth and sustainable economic development.

1.5.5 Government and Other Regulatory Bodies

The findings help in achievement of vision 2030 through creating a global competitive, diversified and prosperous country by improving the performance of Kenyan manufacturing firms through utilizing best supply chain scalability resulting on high performance. On the other hand, the study provides relevant information that would help the government and other regulatory bodies to formulate and implement food safety policies that would facilitate effective strategic management on the control of health and safety standards as required by the regulatory bodies. The findings of this study would also help the policy makers to review and develop policies that would guide Food and beverages manufacturing firms in Kenya.

1.5.6 Future Researchers and Scholars

The findings of this study are of great benefit to future researchers and scholars as it gives them access to relevant literature and thus provides them with more information for future research. It helps them identify different areas that need improvements. It also helps them understand deeply the Supply Chain Scalability strategies for competitive of Food and beverage manufacturing firms in Kenya. The study also assists scholars and researchers in gaining knowledge that will go a long way by adding its contribution to the knowledge domain. The study creates confidence to those who intend to carry their study on the effects of supply chain scalability strategies on performance Food and beverage manufacturing firms in Kenya since they can use the study as a reference document.

1.6 Scope of the Study

The research sought to establish the effects of supply chain scalability strategies on performance Food and beverage manufacturing firms in Kenya. The study was carried from 68 food and beverage manufacturing firms in Kenya in order to get information in regard to the effects of supply chain scalability (supply chain automation, supply chain integration, value chain mapping and supply chain agility) on performance of food and beverage firms in Kenya. The unit of analysis in this study was all the food and beverage manufacturing firms in Kenya. According to Kenya Association of Manufacturers (2023), there are 68 food and beverage manufacturing firms in Kenya. These food and beverage manufacturing firms in Kenya were chosen due to their major contribution to the economy in terms of competitive Supply Chain Practices. They are exposed to how competitive environment is done and thus they were a very resourceful tool in the study. The unit of observation was heads of four departments, which include Supply chain and Logistics department, Quality Assurance (QA) and Quality Control (QC) department, Production/Operations Department and Sales and Marketing. The target population for this study comprised 544 heads and assistant heads from four key departments, Supply Chain and Logistics, Quality Assurance and Quality Control (QA/QC), Production/Operations, and Sales and Marketing, across 68 food and beverage

manufacturing firms in Kenya. The study analyzed data collected between January 2020 and December 2023, using a mixed-methods approach that includes surveys and interviews with relevant professionals.

1.7 Limitations of the Study

This study acknowledges several limitations inherent in the research context and methodology. First, the study relied on self-reported data from senior managers and procurement heads, which may be subject to reporting bias or social desirability effects, particularly when responding to questions about supply chain scalability and firm performance. While measures such as anonymizing questionnaires and securing formal permission from firm management and the Kenya Association of Manufacturers (KAM, 2019) were taken to minimize these effects, the possibility of partial disclosure cannot be completely eliminated.

Secondly, the study was cross-sectional in nature, capturing data at a single point in time, which limits the ability to infer long-term trends or causal relationships between supply chain scalability, supplier capability, and firm performance. Third, the sample was restricted to sixty-eight (68) food and beverage manufacturing firms in Nairobi County, which may limit the generalizability of findings to other regions or smaller firms outside the sample. Despite these constraints, the study provides valid insights into the relationship between supply chain scalability and performance within the Kenyan food and beverage manufacturing sector.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the various theories that exist on effects of Influence of Supply Chain Scalability on Performance of Food and beverage manufacturing firms. It specifically covers the empirical studies, conceptual framework critique of the literature review and the research gaps. A literature review is an assessment of a body of research that addresses the research question the purpose of literature review is to identify what is already known.

2.2 Theoretical Framework

A theoretical framework provides the foundation for a study by explaining the key theories that support the relationships between variables under investigation. It helps guide the research by offering a structured perspective for interpreting findings and linking them to existing knowledge. A theory is a set of statements or principles devised to clarify a group of facts or phenomena, particularly one that has been repeatedly tested or is widely accepted, and can be used to make predictions about natural phenomena. This study was grounded in five theories which include adaptive structuration theory, information processing theory, porter's value chain model, technology acceptance model and dynamic capabilities theory.

2.2.1 Adaptive Structuration Theory

Adaptive Structuration Theory (AST) was developed by organizational theorist Anthony Giddens in the 1980s as a framework for explaining how individuals and groups interact with and are influenced by social structures within organizations (Wang, Deng & Teo, 2023). The theory is grounded in the concepts of social structure and human agency, proposing that individuals both shape and are shaped by the rules, norms, and resources present in their social environments. According to AST, organizations consist of formal

structures such as roles, procedures, and policies, as well as informal structures including values, norms, and communication patterns, which collectively influence behavior and interaction among organizational members (Moin & Khan, 2023). The theory emphasizes that individuals possess the capacity to act independently, enabling them to interpret, adapt, and modify organizational structures to achieve desired outcomes.

AST assumes that organizations are dynamic and continuously evolving systems influenced by both internal and external factors (Morganti, Teittinen & Lill, 2022). It posits that organizational structures and practices are not fixed but are subject to ongoing negotiation and adaptation by individuals within the organization. The theory further assumes that individuals possess agency, meaning they can make independent decisions, reinterpret rules, and adjust their actions in response to changing circumstances (Shao & Li, 2022). In addition, AST highlights the central role of communication and interaction in shaping organizational behavior, as these processes enable individuals to coordinate activities, negotiate meanings, and develop shared understandings that guide collective action. Through these assumptions, the theory explains how structures and human actions mutually influence each other.

Adaptive structuration theory is used in this study to explain the effect of supply chain agility on the performance of food and beverage manufacturing firms in Kenya. The theory explains how elements of supply chain agility, such as distribution flexibility, product innovation, and responsiveness to change, act as structural resources that are actively interpreted and utilized by organizational members to enhance performance (Moin & Khan, 2023). Managers and employees use these agile practices to adjust distribution channels, develop innovative products, and respond quickly to changing market conditions and disruptions (Otieno, 2024). Through this interaction between organizational structures and human agency, firms are able to improve operational efficiency, reduce lead times, and strengthen competitiveness. AST therefore provides a suitable framework for explaining how supply chain agility contributes to improved performance in food and beverage manufacturing firms in Kenya (Morganti, Teittinen & Lill, 2022).

2.2.2 Information Processing Theory

Information Processing Theory (IPT) was developed by psychologists George A. Miller, James R. Anderson, and Ulric Neisser in the 1950s and 1960s to explain how individuals receive, process, store, and retrieve information (Hamilton, Hockey & Rejman, 2022). The theory compares the human mind to a computer system that processes information through a series of structured stages, including input, processing, storage, and output. According to the theory, sensory data are received, encoded into memory, stored, and later retrieved to support decision-making and action. It further explains that mental processes occur sequentially, and individuals have limited cognitive capacity, meaning they can only process a certain amount of information at a given time. This perspective provides a systematic explanation of how information flows through cognitive systems.

Information processing theory assumes that the human mind consists of different memory systems and control processes that work together to manage information (Kamau, 2013). The theory proposes that attention mechanisms allow information to enter the cognitive system, working memory manipulates and processes the information, and long-term memory stores it for future use. It also assumes that information is encoded and stored in different forms depending on relevance, attention, and cognitive structure (Taylor & Crocker, 2022). Additionally, the theory emphasizes hierarchical processing, where higher-level cognitive functions build upon lower-level processes such as perception and memory. It also recognizes the importance of feedback and control processes that enable individuals to monitor and adjust their cognitive activities based on performance and environmental conditions (Giannakis & Mishra, 2022).

Information processing theory was utilized to explain the effect of supply chain integration on the performance of food and beverage manufacturing firms in Kenya. The theory explains how integration practices such as IT integration, internal resource integration, and supply chain collaboration enhance the flow, accuracy, and timeliness of information across the supply chain. Through IT integration, firms can collect, analyze, and share real-time data on production, inventory, and demand, which improves decision-making and

operational efficiency (George et al, 2022). Internal resource integration promotes coordination among departments, leading to better communication and efficient resource utilization (Koschmann, 2023). Similarly, supply chain collaboration enables firms to share knowledge and forecasts with partners, enhancing responsiveness and innovation (Bellini-Leite, 2022). Through improved information flow and coordinated decision-making, integration contributes to better performance outcomes.

2.2.3 Porter's Value Chain Model

Porter's value chain model was developed by Michael E. Porter in 1985 as part of his work on competitive strategy and competitive advantage. The model was introduced in Porter's book Competitive Advantage: creating and sustaining superior performance, where he explained how organizations create value through a series of coordinated activities. The value chain model divides a firm's activities into primary and support functions. Primary activities include inbound logistics, operations, outbound logistics, marketing and sales, and service, while support activities consist of procurement, technology development, human resource management, and firm infrastructure (Ayvaz, 2024). Porter argued that competitive advantage arises when firms perform these activities more efficiently or effectively than their competitors, thereby creating greater value for customers and improving organizational performance.

The value chain model assumes that organizations are composed of interconnected activities that collectively contribute to value creation and competitive advantage (Miao, 2021). It posits that each activity within the chain has the potential to add value or increase costs, and therefore firms must analyze and optimize these activities to improve overall efficiency and effectiveness. The model also assumes that competitive advantage is achieved through either cost leadership or differentiation, which results from how well these activities are configured and coordinated. In addition, the theory emphasizes the importance of linkages between activities, suggesting that improvements in one area of the value chain can positively influence other activities (Porter, Nabi & Lee, 2021).

Organizations can identify inefficiencies, eliminate waste, and enhance value creation, by systematically examining each component of the value chain.

Porter's value chain model was utilized in the study to explain the effect of value chain mapping on the performance of food and beverage manufacturing firms in Kenya. Value chain mapping enables firms to identify, analyze, and improve the various activities involved in sourcing raw materials, processing, distribution, and customer service (Dacha, Omwenga & Namusonge, 2023). Through mapping, firms can detect inefficiencies, reduce operational costs, and enhance coordination among different functions. The model helps explain how improvements in activities such as procurement, production processes, logistics, and distribution contribute to better operational efficiency, product quality, and customer satisfaction. Food and beverage manufacturing firms can streamline operations, eliminate non–value-adding activities, and strengthen their competitive position, by applying value chain mapping, ultimately leading to improved organizational performance.

2.2.4 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Fred Davis in the late 1980s and later expanded by Fred Davis and Richard Bagozzi as a framework for explaining and predicting users' acceptance of new information technologies. The model proposes that an individual's intention to use a technology is primarily influenced by two factors: perceived usefulness and perceived ease of use (Çolak, 2022). Perceived usefulness refers to the extent to which a person believes that using a particular technology will improve job performance, while perceived ease of use relates to the degree to which the technology is perceived as effortless to learn and operate (Baraiya & Ramtiyal, 2023). These two factors shape users' attitudes toward the technology, which in turn influence their behavioral intention and actual adoption.

The Technology Acceptance Model assumes that users are rational decision-makers who evaluate the expected benefits and effort associated with a technology before deciding to

adopt it (Chowdhury, Rodriguez-Espindola & Budhwar, 2023). The theory posits that perceived usefulness and perceived ease of use are the primary determinants of users' attitudes, intentions, and actual usage behavior. It also assumes that user perceptions, rather than the objective features of a technology, shape adoption decisions. Additionally, TAM recognizes that external factors such as organizational support, social influence, and facilitating conditions may affect users' perceptions and adoption behavior, even though these elements are not part of the core model (Katebi, Homami & Najmeddin, 2022). These assumptions explain how individual perceptions drive technology acceptance within organizations.

Technology acceptance model is used in this study to explain the effect of supply chain automation on the performance of food and beverage manufacturing firms in Kenya. The model helps explain how the adoption of automation technologies, such as warehouse automation, document automation, and tender automation, depends on employees' perceptions of their usefulness and ease of use. When employees perceive these automated systems as tools that improve efficiency, reduce errors, and enhance productivity, they are more likely to adopt them, leading to improved operational performance (Ozturen, Lodhi & Ongsakul, 2022). Similarly, systems that are user-friendly and require minimal training are more readily accepted by employees, increasing efficiency and accuracy across supply chain processes (Katebi et al., 2022). Through improved acceptance and utilization of automated technologies, firms can enhance supply chain efficiency and overall performance (Joseph Ng & Eaw, 2023).

2.2.5 Dynamic Capabilities Theory

Dynamic Capabilities Theory, initially developed by David J. Teece in the 1990s, provides a framework for understanding how firms develop, integrate, and reconfigure resources to sustain competitive advantage in dynamic and uncertain environments (Azevedo, Boavida & Johansson, 2022). The theory emphasizes that competitive advantage stems not merely from possessing valuable resources, but from a firm's ability to sense opportunities, seize them, and transform its resource base over time in response to

environmental changes. Dynamic capabilities represent a firm's capacity to create, extend, or modify resources decisively to achieve superior economic value relative to competitors. These capabilities are critical for maintaining enterprise-level competitiveness in rapidly changing technological or market conditions, as they enable firms to continuously adapt processes, assets, and knowledge. Central to the theory is the strategic reconfiguration of complementary resources, highlighting adaptability and innovation as key drivers of sustained firm success.

Dynamic capabilities theory assumes that the business environment is constantly changing, uncertain, and complex, requiring firms to continuously adapt and evolve to maintain competitiveness (Dubey, Foropon & Papadopoulos, 2023). The theory posits that firms are heterogeneous in their resources, capabilities, and organizational structures, which explains differences in their ability to sense, seize, and transform opportunities. It further assumes that dynamic capabilities are not static but are developed over time through learning, experimentation, and adaptation (Köhler, Sönnichsen & Beske-Jansen, 2022). The model emphasizes three key processes: sensing opportunities in the market, seizing them by mobilizing resources effectively, and transforming organizational processes to exploit opportunities. Firms can respond effectively to environmental shifts, improve efficiency, and sustain long-term performance, by continually renewing and reconfiguring their knowledge, skills, and assets making dynamic capabilities a critical determinant of success in volatile markets.

Dynamic capabilities theory in this study has been used to explain the moderating effect of supplier capability on the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya. The theory suggests that firms with suppliers possessing strong capabilities are better able to scale supply chain operations effectively and respond to market fluctuations. Supplier capabilities, including logistics, operational efficiency, and organizational structure, enhance a firm's ability to expand production, improve inventory management, and ensure timely delivery of products. High supplier capability allows firms to manage increased demand, introduce new products rapidly, and mitigate risks associated with market volatility. Firms

strengthen the impact of supply chain scalability on performance, as suppliers support flexibility, coordination, and resource optimization, by leveraging these capabilities, enabling firms to achieve superior operational outcomes and maintain competitiveness in dynamic and uncertain environments.

2.3 Conceptual Framework

A conceptual framework is a diagram that illustrates the relationship between independent, dependent, and moderating variables. Figure 2.1 shows the link between these variables. The independent variables in this study include supply chain agility, supply chain integration, value chain mapping, and supply chain automation, while the dependent variable is the performance of food and beverage manufacturing firms in Kenya. The moderating variable was supplier capability.

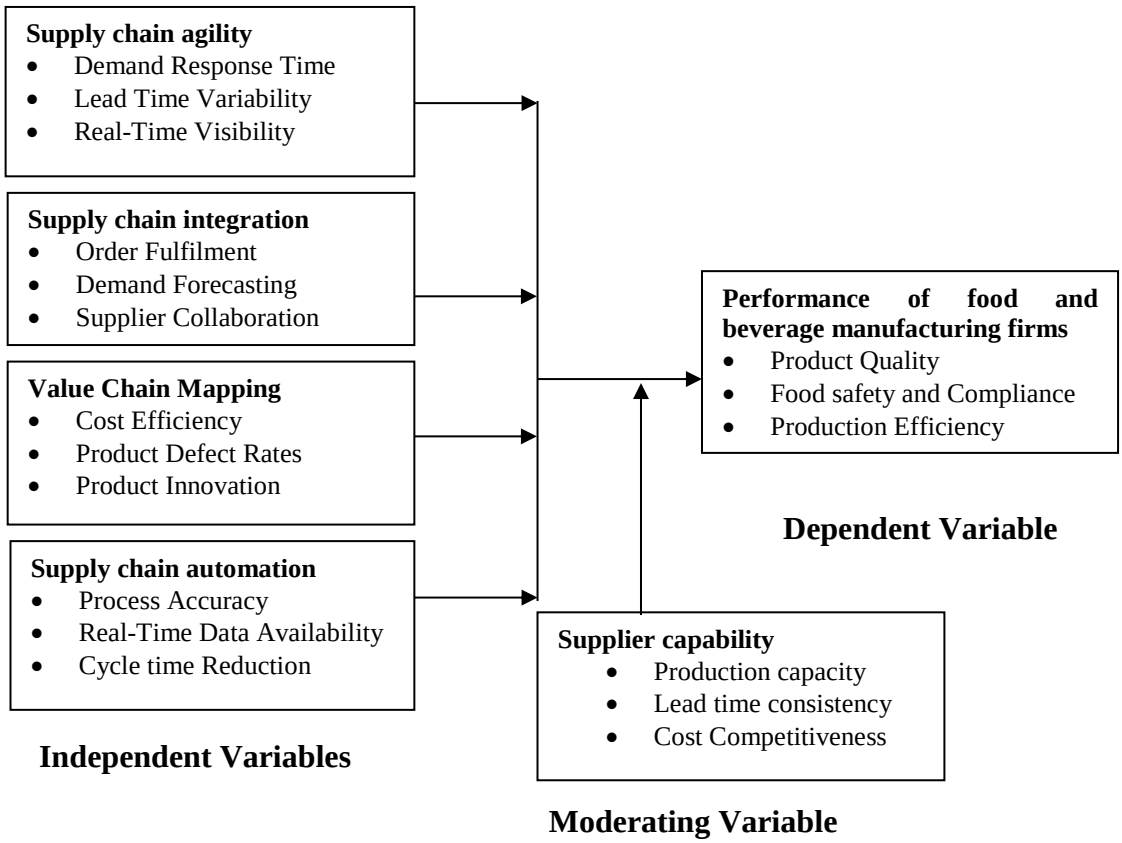

Figure 2.1: Conceptual Framework

2.3.1 Supply Chain Agility

Supply chain agility plays a pivotal role in the performance of organizations navigating dynamic and uncertain business environments. It encompasses three key components: response time to demand changes, lead time variability, and visibility with real-time data availability, each of which contributes to the overall efficiency, competitiveness, and resilience of organizations (Usman, 2023). Supply chain agility is a comprehensive approach that includes systematic processes, policies, and strategies implemented by organizations to adapt quickly to external changes while maintaining operational performance. The primary goal of supply chain agility is to ensure that supply chain activities are aligned with market dynamics, customer expectations, and strategic objectives. This involves a continuous cycle of planning, monitoring, controlling, and improving supply chain responsiveness (Rugabuka, 2022). Key components include minimizing response times to demand changes, managing lead time variability, and ensuring visibility with real-time data availability.

Response time to demand changes is a fundamental aspect of supply chain agility that involves the ability of organizations to quickly adjust production, procurement, and distribution in response to shifts in customer demand or market conditions (Wanje & Lambaino, 2023). The primary objective of minimizing response time is to prevent stockouts or overproduction, meet customer expectations, and sustain service levels. This typically includes streamlining order-to-fulfillment processes, adopting agile planning practices, and enabling rapid decision-making across the supply chain. By prioritizing fast response to demand changes, organizations can maintain competitiveness, improve customer satisfaction, and enhance operational efficiency (Usman, 2023).

Lead time variability management is a critical component of supply chain agility that involves monitoring, controlling, and reducing fluctuations in the time required to complete supply chain activities, from order placement to delivery (Rugabuka, 2022). Unlike response time, which focuses on speed, lead time variability emphasizes consistency and predictability in supply chain operations. Activities may include

optimizing production schedules, improving supplier coordination, and leveraging buffer strategies to absorb delays. The goal of managing lead time variability is to ensure reliability, reduce operational disruptions, and improve overall supply chain performance (Wanje & Lambaino, 2023). Effective lead time management enables organizations to plan resources accurately, fulfill orders efficiently, and maintain customer trust.

Visibility and real-time data availability is a crucial component of supply chain agility that involves the ability to monitor, track, and access accurate supply chain information in real time (Usman, 2023). Unlike the other components, which focus on operational adjustments, visibility emphasizes timely and informed decision-making. Activities may include implementing digital tracking systems, data analytics platforms, and information-sharing protocols across the supply chain. The goal of visibility is to enhance transparency, detect potential disruptions early, and enable proactive responses to changes in demand or supply conditions (Rugabuka, 2022). Organizations with high visibility can anticipate risks, optimize resource allocation, and sustain operational efficiency, thereby maintaining a competitive advantage in rapidly changing markets.

2.3.2 Supply Chain Integration

Supply chain integration is the strategic process of systematically aligning and coordinating IT systems, internal resources, and collaborative relationships across the supply chain. The primary objective of supply chain integration is to ensure seamless flow of materials, information, and resources across procurement, production, and distribution, thereby enhancing operational efficiency, responsiveness, and competitiveness (Oliveira & Gonzalez, 2022). Effective integration enables organizations to minimize inefficiencies, synchronize operations, and improve performance. Supply chain integration comprises of the following indicators order fulfillment and cycle time, demand forecast accuracy, and supplier collaboration (Mbugua & Okech, 2023). These indicators help organizations measure how well integration improves responsiveness to customers, optimizes inventory and production flows, and enhances coordination among partners, all

of which contribute to operational efficiency, cost-effectiveness, and competitive advantage in increasingly dynamic and uncertain markets.

Order fulfillment and cycle time are critical measures of supply chain efficiency and responsiveness, reflecting the organization's ability to deliver products to customers reliably and within expected timeframes (Siagian & Johono, 2022). IT integration enables real-time monitoring of inventory, production schedules, and shipments, ensuring faster decision-making and reducing delays throughout the supply chain (Mogaka, 2023). Internal resource integration aligns manufacturing, procurement, and logistics functions, minimizing process redundancies and optimizing workflow to shorten cycle times (Omondi, 2022; Hassan, 2023). By streamlining operations and synchronizing processes, organizations improve order fulfillment rates, enhance customer satisfaction, and reduce costs. Efficient cycle times allow companies to respond swiftly to market fluctuations and maintain operational reliability, ultimately supporting overall supply chain agility and competitive positioning.

Demand forecast accuracy is a key indicator for anticipating market needs, planning production, and ensuring optimal inventory management, directly influencing supply chain efficiency and responsiveness (Wang, Chen & Zhang, 2022). IT integration, through systems like ERP and big data analytics, allows organizations to analyze real-time sales, market trends, and inventory data, generating reliable demand forecasts (Junaid, Zhang & Syed, 2022). Internal resource integration ensures that production schedules, procurement activities, and inventory levels are aligned with these forecasts, reducing risks of stock outs, overproduction, and excess inventory (Gamachu & Patrick, 2023). Accurate forecasts support timely decision-making, efficient resource allocation, and effective planning. This enables firms to respond proactively to changing demand, improve supply chain visibility, and sustain operational efficiency, thereby enhancing competitiveness and resilience in dynamic market environments.

Supplier collaboration is essential for enhancing integration across the supply chain, allowing organizations and suppliers to work jointly to plan, coordinate, and execute

supply chain operations for mutual benefit (Agyei-Owusu, Nuertey & Acquah, 2022). Vertical collaboration connects organizations across different stages of the supply chain, while horizontal collaboration aligns firms at the same stage serving similar customers. Effective collaboration relies on trust, transparency, and communication, enabling partners to share information, jointly manage inventories, plan production, and respond rapidly to demand fluctuations (Thneibat & Al-Mufleh, 2023). Initiatives such as joint demand planning, vendor-managed inventory (VMI), and collaborative product development strengthen supplier partnerships, reduce lead time variability, enhance order fulfillment, and improve forecast accuracy. By fostering supplier collaboration, organizations increase agility, optimize operations, mitigate risks, and drive sustainable performance and long-term competitiveness.

2.3.3 Value Chain Mapping

Value chain mapping is a strategic process of systematically identifying, analyzing, and visualizing all activities, actors, and relationships involved in creating and delivering a product or service. The primary objective of value chain mapping is to provide organizations with a comprehensive understanding of the flow of materials, information, and resources from raw materials to end customers, while identifying inefficiencies, bottlenecks, and opportunities for improvement (Priyanka & Kandpal, 2022). This involves various activities such as data overlays, documenting information, network research, and participatory approaches. Key components include tracing process steps, analyzing resource allocation, and evaluating interdependencies among actors. Effective value chain mapping helps organizations optimize operations, reduce costs, improve product quality, and drive innovation, while enhancing competitiveness, operational efficiency, and strategic decision-making (Bandula & Kibria, 2023).

Cost efficiency is a key indicator in value chain mapping that emphasizes the organization’s ability to minimize production and operational costs while maximizing value creation (Otieno & Mubarik, 2024). Through systematic mapping, firms can identify cost drivers, inefficiencies, and redundancies across procurement, production, and

distribution stages. By using data overlays and documenting process information, organizations can monitor expenditures, optimize resource allocation, and reduce waste. Integration of insights from stakeholders and network research enhances decision-making and ensures that cost-saving measures are sustainable. Effective cost management through value chain mapping improves operational efficiency, strengthens financial performance, supports competitive pricing, and promotes sustainable supply chain practices, enabling firms to achieve long-term profitability while maintaining high-quality standards.

Product quality and defect rates are critical indicators in value chain mapping, reflecting an organization's ability to consistently deliver products that meet or exceed customer expectations (Ocharo & Noor, 2020). Mapping the value chain allows firms to trace quality checkpoints, monitor defect occurrences, and implement corrective actions across production, assembly, and distribution stages. Through participatory approaches, documenting information, and analyzing network relationships, organizations can identify areas where quality improvements are needed and collaborate with suppliers to reduce errors. Managing product quality and defect rates ensures higher customer satisfaction, reduces returns and rework, and strengthens brand reputation. Integrating these insights into value chain mapping fosters continuous improvement, operational excellence, and sustainable competitiveness.

Innovation and product development is an essential indicator in value chain mapping, focusing on an organization's ability to develop and introduce new or improved products to meet market demands (Asamoah & Jacqueline, 2023). Value chain mapping enables firms to identify gaps, inefficiencies, and emerging customer needs that drive research and development initiatives. Data overlays, documentation, and stakeholder collaboration help organizations allocate resources effectively, streamline development processes, and accelerate time-to-market for new products. By leveraging insights from the value chain, firms can enhance creativity, adopt agile development practices, and co-create innovative solutions with suppliers and partners. Integrating innovation and product development into value chain mapping supports sustainable growth, operational efficiency, and competitive differentiation in dynamic markets.

2.3.4 Supply Chain Automation

Supply chain automation is the strategic implementation of advanced technologies and systems to execute supply chain activities with minimal human intervention. The primary objective of supply chain automation is to enhance operational efficiency, improve process accuracy, and optimize the flow of materials, information, and resources across procurement, production, and distribution (Mohsen, 2023). This involves integrating automated software solutions, robotics, and monitoring tools to streamline supply chain operations. Key components include workflow automation, data capture, and technology-enabled decision support. Effective supply chain automation enables organizations to reduce operational errors, shorten cycle times, enhance real-time data availability, and maintain competitiveness (Wanjiru & Noor, 2023). By embedding automation into supply chain strategies, firms strengthen performance, responsiveness, and sustainability in increasingly dynamic and interconnected business environments.

Process accuracy and error rate is a critical indicator of supply chain automation, reflecting the ability to execute operations precisely while minimizing mistakes (Weerasinghe, 2022). Automated systems reduce human intervention in repetitive and complex tasks, thereby lowering the likelihood of errors in order processing, inventory management, and production scheduling. Technologies such as robotics, barcode scanning, and automated data entry ensure consistency and standardization across workflows. Monitoring process accuracy and error rates allows organizations to maintain quality control, reduce operational disruptions, and enhance reliability throughout the supply chain (Andiyappillai, 2021). Improved accuracy strengthens customer satisfaction, minimizes defect-related costs, and supports overall operational performance, making automation a key enabler of supply chain excellence and efficiency.

Real-time data availability is an essential indicator of supply chain automation, emphasizing the organization's capacity to access, analyze, and share critical information instantly across operations (Mazikana, 2023). Automation captures data from multiple points in the supply chain, including inventory levels, production progress, and shipment

tracking, offering stakeholders immediate insights for informed decision-making. This capability enhances demand forecasting, risk mitigation, and coordination among suppliers, manufacturers, and distributors. Automated dashboards and analytics tools facilitate rapid responses to fluctuations in market demand or unexpected disruptions (Wanjiru & Noor, 2024). Effective real-time data availability improves visibility, strengthens operational efficiency, and equips organizations to maintain competitiveness and agility in complex and dynamic business environments.

Cycle time reduction is a key indicator of supply chain automation, focusing on minimizing the duration required to complete operational processes from order placement to delivery (Rapando & Juma, 2020). Automation accelerates workflows, integrates planning and execution systems, and reduces bottlenecks in procurement, production, and distribution activities. By synchronizing processes, optimizing scheduling, and implementing automated material handling, organizations can shorten lead times and enhance responsiveness to customer demands. Reduced cycle times improve service levels, lower inventory holding costs, and minimize operational inefficiencies. Integrating cycle time reduction into supply chain automation strategies enables firms to maintain agility, operational excellence, and long-term competitiveness in rapidly changing markets.

2.3.5 Supplier Capability

Supplier capability is the strategic assessment of a supplier's ability to deliver goods or services that consistently meet organizational requirements in terms of quality, cost, and responsiveness. The primary objective of evaluating supplier capability is to ensure that suppliers possess the resources, expertise, and processes to support operational efficiency, reliability, and competitiveness (Prastia & Nursyamsia, 2020). This involves systematically analyzing production processes, lead times, cost structures, and operational flexibility. Key components include monitoring supplier performance, evaluating responsiveness to demand fluctuations, and assessing resource adequacy. Effective supplier capability evaluation enables organizations to mitigate supply chain risks,

enhance operational continuity, strengthen stakeholder relationships, and optimize procurement decisions. By embedding supplier capability assessment into supply chain strategies, firms ensure sustainable performance, improved competitiveness, and resilient operations in dynamic markets (Kiptoo & Miroga, 2023).

Production capacity and flexibility is a key indicator of supplier capability, reflecting the supplier's ability to meet varying demand volumes while adapting to changing production requirements (Zhang, Comite & Matac, 2022). Suppliers with sufficient capacity and operational flexibility can scale outputs, adjust production schedules, and respond promptly to urgent or customized orders. Evaluating this indicator involves assessing workforce adaptability, machinery availability, production efficiency, and contingency planning. High production capacity and flexibility allow organizations to respond to market fluctuations, reduce stockouts, and maintain service levels (Kareem, 2020). Collaborating with suppliers who demonstrate strong production adaptability enhances operational reliability, minimizes disruption risks, and strengthens supply chain resilience, ultimately supporting sustained performance and customer satisfaction.

Lead time consistency is another critical indicator of supplier capability, emphasizing the supplier's ability to deliver products within agreed timelines while minimizing variability (Siagian & Johono, 2022). Consistent lead times enable accurate production planning, inventory management, and order fulfillment, reducing uncertainty across the supply chain. Evaluating lead time consistency involves analyzing historical delivery data, monitoring adherence to schedules, and assessing responsiveness to unexpected disruptions. Suppliers who maintain reliable lead times allow organizations to optimize inventory levels, improve service reliability, and respond efficiently to fluctuations in customer demand (Scheer, Miao & Garrett, 2020) Ensuring consistent lead times strengthens collaboration between supply chain partners, reduces operational risks, and enhances overall supply chain performance and competitiveness.

Cost competitiveness is a key indicator of supplier capability, focusing on the supplier's ability to provide goods or services at optimal cost without compromising quality or

reliability (Mogaka, 2023). Evaluating cost competitiveness requires analyzing pricing structures, production efficiency, economies of scale, and cost-control practices. Suppliers offering competitive pricing while maintaining quality enable organizations to optimize procurement budgets, reduce operational expenses, and enhance profitability. Maintaining cost-effective supplier relationships also fosters long-term collaboration, strategic alignment, and supply chain sustainability (Kareem, 2020). Integrating cost competitiveness into supplier capability assessment ensures that suppliers contribute to operational efficiency, financial performance, and sustainable competitive advantage in increasingly dynamic and cost-sensitive markets.

2.3.6 Performance of Food and Beverages Manufacturing Firms in Kenya

Performance of food and beverage manufacturing firms refers to the capacity of these organizations to achieve operational, quality, and strategic objectives while remaining competitive in dynamic markets. It encompasses multiple dimensions, including product quality, food safety, regulatory compliance, and production efficiency, all of which directly influence customer satisfaction, market share, and profitability (Alfalla-Luque, García & Marin-Garcia, 2023). Monitoring and managing these indicators allow firms to optimize internal processes, allocate resources effectively, and mitigate operational risks. High-performing firms can maintain consistency in output, adhere to stringent regulatory standards, and respond efficiently to changes in consumer demand. Embedding performance evaluation into management strategies ensures sustained competitiveness and resilience in the face of market fluctuations, technological changes, and global industry challenges (Çetindaş, Kanuşağı & Öztürk, 2023)

Product quality and consistency is a crucial performance indicator, emphasizing the delivery of products that meet predefined standards for taste, texture, appearance, and nutritional value (Al-Maaitah, 2024). Maintaining consistent quality requires robust quality management systems, standardized procedures, and continuous monitoring throughout the production process. By ensuring uniformity across batches, firms enhance customer trust, reduce complaints and returns, and build brand loyalty. Product quality

management also minimizes waste, lowers production costs, and ensures compliance with national and international standards. Firms that prioritize consistency can maintain operational efficiency, respond effectively to fluctuations in demand, and strengthen their market position. Ensuring high-quality output supports sustainable competitiveness while enabling organizations to innovate and differentiate their offerings in the fast-paced food and beverage sector (Kankam & Dza, 2023).

Food safety and compliance is another vital indicator of performance, reflecting a firm's capacity to adhere to safety regulations, hygiene protocols, and industry standards during production, processing, and distribution (Osoro, Noor & Nyanga'u, 2024). Effective food safety measures involve hazard analysis, critical control points, staff training, and frequent inspections to mitigate contamination risks. Compliance ensures consumer protection, avoids legal penalties, and preserves brand reputation. Firms that consistently maintain food safety standards can foster stakeholder trust, enhance operational reliability, and prevent costly disruptions. Integrating stringent safety protocols within supply chain and production processes enhances regulatory adherence while supporting quality management objectives. Prioritizing food safety also strengthens market competitiveness, positions firms as reliable producers, and underpins long-term sustainability in the food and beverage industry (Alfalla-Luque, García & Marin-Garcia, 2023).

Production efficiency is a fundamental performance indicator, focusing on optimizing resource utilization, minimizing waste, and maximizing output within target timelines (Rugabuka, 2022). Efficient production requires effective planning, streamlined workflows, modern equipment, and a skilled workforce to reduce bottlenecks and cycle times. By enhancing production efficiency, firms can meet demand promptly, lower operational costs, and improve overall profitability. It also allows flexibility in responding to market changes, seasonal demand variations, and new product introductions. High production efficiency supports consistent quality, reinforces food safety measures, and strengthens supply chain performance. By systematically monitoring and improving efficiency, food and beverage manufacturers can maintain competitiveness, satisfy

consumer expectations, and ensure sustainable growth and resilience in an evolving market environment (Demere, 2022).

2.4 Empirical Review

Recent literature in the supply chain scalability has an address and proposes that the key factor to surviving in these changing situations is through Supply Chain Scalability by the formation of the responsive supply chain. Researchers and scholars have advanced theories and concepts to demonstrate the importance of supply chain scalability in any sector of an economy. based on the study of the assessment and prioritizing of supply chain scalability are considered as a key factor affecting the ability of distribution performance.

2.4.1 Supply Chain Agility

In the United States, Park, Braunscheidel and Suresh (2023) examined the performance effects of supply chain agility with sensing and responding as formative capabilities. Survey research methodology is employed, and data analysis is conducted using partial least squares techniques and mediation tests using Hayes Process macro. Firm's supply chain agility (FSCA) is established as a revised construct shaped by the distinct capabilities of sensing and responding. The efficacy of utilizing FSCA as a formative second-order construct is demonstrated. Moreover, FSCA is found to influence business performance through mediations of cost efficiency and customer effectiveness, thereby confirming its predictive validity. Drawing on resource-based view and resource-advantage theories, the reformulation of supply chain agility as a formative construct of sensing and responding capabilities paves the way for new avenues of research on agility.

Alfalla-Luque, García and Marin-Garcia (2023) conducted a study on impact of supply chain agility (SCA) on performance based on previous empirical research, while also examining the influence of various moderators. A meta-analysis approach is employed, drawing from a systematic literature review of 63 empirical papers comprising a sample

of 14,469 firms. Substantive moderators such as type of performance and SCA operationalization, as well as extrinsic moderators including economic region and industry, are considered. The results confirm a significantly large, positive correlation between SCA and performance. However, none of the analyzed moderators reveal significant differences in the SCA-performance correlations across subgroups. High heterogeneity in total variance underscores the need for further empirical research with rigorously reported variables, frameworks, and validated scales.

In India, Panigrahi, Meher and Shrivastava (2023) investigated the influence of supply chain agility (SCA) on operational performance (OP) in the context of India's steel manufacturing firms. Through an experimental research design, data were collected from 398 key officials within the industry. Smart-partial least squares (PLS) version 3.3.2, incorporating confirmatory factor analysis and PLS structural equation modeling, was employed for analysis. The findings reveal that the SCA factor (SCAF) significantly impacts the firm’s OP, with cost efficiencies partially mediating this relationship. Moreover, the impact of cost efficiencies on OPs is found to be more significant compared to the impact of SCAF on cost efficiencies. Therefore, management teams in the manufacturing industry prioritize SCA as a crucial concept for responding to market needs in volatile environments.

In Malaysia, Mukhsin, Taufik and Suryanto (2022) examined the mediation role of supply chain agility on supply chain orientation-supply chain performance link. It specifically examined the mediation effect of supply chain performance on the relationship between supplier flexibility, supply agility, and company performance within the broiler industry of Banten Province. The population comprised 100 broiler farms in various districts and cities. Primary data were collected through questionnaires distributed to the participants. The results indicate that both supplier flexibility and supply agility positively and significantly influence company performance. Additionally, supplier flexibility and supply agility positively and significantly impact supply chain performance. Moreover, supply chain performance serves as a significant mediator between supplier flexibility, supply agility, and company performance.

In Pakistan, Manzoor, Rehman and Sajjad (2022) studied the effect of supply chain agility and lean practices on operational performance. Data was collected through a survey method using self-administered questionnaires from supply chain managers, operational managers, and general managers in two rounds with a two-month lag time to mitigate common-method bias. The questionnaire employed a Likert scale (1–5), and data analysis was conducted using Smart PLS 3 and SPSS 23. The study reveals that SCA directly and positively influences operational performance, while LP also exerts a positive impact on operational performance. Additionally, competitive advantage fully mediates the relationship between SCA and operational performance.

In the Pakistan pharmaceutical industry, Ahmad, Shahzad and Aftab (2023) examined the relationship between supply chain agility (SCA) and firm performance. Data were collected from 204 top executives across various supply chain functions in national and multinational pharmaceutical companies in Pakistan, including planning, supplying, operations, and purchasing. Utilizing a serial-mediation model, the study identifies the strength of various SCA enablers and explores the mediating roles of delivery dependability. Results shed light on the mechanisms through which different enablers contribute to SCA and ultimately firm performance in the context of the Pakistani pharmaceutical industry.

In Turkey, Çetindaş, Kanuşağı and Öztürk (2023) looked into the effects of supply chain agility on firm performance and the role of demand stability in this relationship. Through structural equation modeling (SEM), the study investigated the effects of supply chain agility and demand stability on firm performance, while also examining the influence of supply chain agility on demand stability. During the COVID-19 pandemic period, data analysis reveals that supply chain agility positively affects both demand stability and firm performance. Furthermore, demand stability positively influences firm performance. The results also indicated that demand stability mediates the relationship between supply chain agility and firm performance, although it does not exhibit a moderating effect.

Among firms in Iran, Firoozi, Seifollahi and Zarei (2024) examined the effect of supply chain agility on relational and operational performance with the moderating role of industry type. The study consolidated and compared the results of experimental studies using a meta-analysis approach. Nineteen final studies were identified and analyzed using the Comprehensive Meta-Analysis 2 (CMA2) software following the Prism protocol. The results indicate a significant influence of supply chain agility on both relational and operational performance, with a stronger effect observed on relational performance. Additionally, the analysis reveals that the type of industry moderates the relationship between supply chain agility and performance, with particularly pronounced effects within unique industries.

In Jordan, Al-Maaitah (2024) examined the interplay between supply chain agility, human capital and supply chain performance in the healthcare sector. Using a quantitative approach, data were collected from 139 managers across various levels in different hospitals in Jordan through an online questionnaire. Statistical Package for Social Sciences (SPSS) version 23 was employed for data analysis. Results from hypothesis testing using multivariate regression analysis reveal that human capital positively and significantly impacts both supply chain performance and supply chain agility. Human capital emerges as a crucial organizational resource that contributes to favorable performance outcomes. This resource is vital for healthcare institutions to gain a competitive edge by effectively responding to patients' treatment needs.

In Thailand, Jermsittiparsert (2022) examined the effect of supply chain agility on operational performance. Among 360 selected respondents, 267 responded, yielding a response rate of 74%. Partial Least Squares Structural Equation Modeling was conducted using Smart PLS 3.0 for inferential analysis. A more agile supply chain can respond rapidly to changes in customer demand or market trends. This responsiveness allows organizations to better match supply with demand, reducing stockouts, backorders, and lost sales while improving customer satisfaction and loyalty. Supply chain agility often involves streamlining processes, reducing lead times, and improving flexibility in production and distribution. Shorter lead times enable organizations to deliver products to

customers more quickly, reducing cycle times and improving overall operational efficiency.

Rugabuka (2022) studied the impact of supply chain agility on organizational performance within the context of EDCL (Energy Development Corporation Limited) spanning from 2018 to 2021. A descriptive survey approach is employed to accurately portray the characteristics of the organization without intervention. The target population consists of 150 individuals, and a sample size of 109 is determined using the Talon Yamane formula. Primary data is collected through a questionnaire, and data processing involves editing, coding, and tabulation. The results indicate a significant positive linear relationship between supply chain agility and organizational performance within EDCL. Specifically, an increase in the implementation of supply chain agility leads to a corresponding increase in organizational performance. Additionally, the study finds that lean supply chain agility also positively influences organizational performance. Through sourcing flexibility, timely delivery of goods and services to user departments is facilitated, further contributing to organizational performance.

In Nigeria, Usman (2023) examined the relationship between supply chain agility and performance of small and medium enterprises in Bauchi State. The cross-sectional survey method was adopted, with data collected through self-administered questionnaires. The population comprised all SMEs registered under SMEDAN in Bauchi metropolis, totaling 364, with a sample size of 183 determined using the Krejcie and Morgan table. Simple random sampling was employed for sample selection. The research instrument was validated, and reliability was confirmed using the Cronbach Alpha coefficient. The findings reveal a positive and significant relationship between organizational agility and SME performance.

In Ghana, Kankam and Dza (2023) examined the relationship between supply chain agility and competitive advantage. Data were collected from 225 businesses through a questionnaire-based survey, and confirmatory factor analysis and structural equation modeling were used for data analysis. The findings indicate that the relationship between

SCA and competitive advantage is significantly influenced by lean marketing. Furthermore, lean marketing partially mediates the relationship between SCA and competitive advantage, with moderating variables revealing an unfavorable influence of lean marketing on this association. The study emphasizes the importance for firms to effectively utilize SCA and lean marketing to attain competitive advantage, adapt to the dynamic business environment, and innovate to meet evolving market needs.

Demere (2022) examined the effect of supply chain agility on business performance in Four-Star Hotels, Addis Ababa. Data were collected through a tailored questionnaire. The survey was conducted among employees of four selected four-star hotels in Addis Ababa. The study focuses on variables including alertness, accessibility, decisiveness, swiftness, flexibility, and organizational performance. The results suggest that supply chain agility significantly influences organizational performance. The study shows the importance of understanding supply chain agility practices to predict future trends and excel in current organizational performance, as well as the need for a proper strategic supply chain framework to adapt to changing market conditions and customer demands.

In Kenya, Osoro, Noor and Nyanga'u (2024) conducted a study on supply chain agility and performance of horticulture exporting firms in Kenya. Guided by Contingency theory, this study aimed to investigate the effects of supply chain agility and the moderating role of regulatory framework compliance on the performance of horticulture exporting firms in Kenya. Descriptive and causal-comparative research designs were employed, targeting all 236 horticulture exporting firms in Kenya. Data were collected from supply chain managers using semi-structured questionnaires and analyzed using SPSS version 26. The findings indicate a positive and significant relationship between supply chain agility and firm performance, with regulatory framework compliance moderating this relationship. The study shows the importance for horticulture exporting firms to invest in enhancing supply chain agility and ensuring regulatory compliance to improve performance.

Wanje and Lambaino (2023) examined the influence of supply chain agility on the performance of supply chain management in seed manufacturing companies in Kenya,

focusing specifically on strategic supplier partnerships and customer relationships. Guided by resource dependence theory and social exchange theory, the study surveyed procurement officers or their equivalents in seed manufacturing companies. Primary data was collected using questionnaires, and SPSS version 25.0 was employed for data analysis, including correlation and multiple regression analyses. The findings reveal that strategic supplier partnership and customer relationship both have positive and significant effects on supply chain management performance in seed manufacturing companies in Kenya.

Chumba, Bonuke and Kirui (2022) examined the relationship between supply chain agility and firm supply chain performance among selected manufacturing firms in Nairobi County, Kenya. Anchored on the positivist paradigm, the study employed an explanatory research design, targeting 591 manufacturing firms with a sample of 233 firms. Questionnaires were used for data collection, and multiple regression models were employed for data analysis. The results indicated that supply chain agility significantly affects supply chain organizational performance. Moderated mediation analysis showed a significant effect, with supplier relationships playing a critical role in enhancing the impact of supply chain agility on performance. Furthermore, the study found that firms with well-established supplier collaboration mechanisms experienced higher responsiveness, operational efficiency, and adaptability, highlighting the importance of supplier management in leveraging agility for superior performance.

Kandie (2022) investigated the influence of supply chain agility on the business performance of Robert Bosch Africa, focusing on market sensitivity, process integration, virtual integration, and network-based agility. Using a correlation research design, data were collected from 110 associates of Robert Bosch Africa across seven countries. The findings reveal that market sensitivity and process integration significantly contribute to business performance. Moreover, virtual integration, although highly rated, demonstrated the least impact on business performance. In addition, network-based agility emerged as a significant contributor to business performance. The study concluded that market sensitivity and process integration play vital roles in enhancing business performance at

Robert Bosch Africa. However, virtual integration, despite its prominence, has a limited impact on performance.

2.4.2 Supply Chain Integration

In Brazil, Oliveira and Gonzalez (2022) examined the dimensions of supply chain integration (SCI) and their influence on companies' operational performance, focusing on the operational processes level. Grounded in the resource orchestration theory, SCI is examined as a multidimensional construct comprising synchronized planning, strategic partnership, operational coordination, and information integration. A quantitative approach was employed, utilizing a questionnaire administered to Brazilian companies across various sectors (Zhang, Comite & Matac, 2022). Structural equation modeling was used for data analysis. The findings confirm the multidimensional nature of SCI and its interdependent relationship among the constructs. Furthermore, SCI significantly and positively impacts operational performance, underscoring the importance of examining this effect at the level of business processes where tangible outcomes are frequently observed.

In Indonesia, Manik (2022) examined the effect of supply chain integration on business performance. A thorough literature review was conducted, analyzing 20 high-quality international journal articles published between 2017 and 2021. The findings highlight methods and frameworks that researchers can utilize to comprehend the implementation of supply chain integration in SMEs, leading to performance improvement, enhanced efficiency, increased customer value, and competitive advantage. The study shows the importance of ongoing research to explore new developments and insights in this field, offering a detailed analysis of key findings and implications.

Among Indonesian pharmaceutical companies Gunawan, Siagian and Tarigan (2024) investigated how internal integration, supplier integration, and customer integration, supported by supply chain capability, can help companies navigate market fluctuations and enhance their competitive performance. A sample of 102 listed Indonesian

pharmaceutical companies was selected using purposive sampling. The findings reveal that supply chain capability positively influences competitive performance. Internal integration, characterized by sharing activity information across departments and coordinating integrated planning, significantly impacts supplier and customer integration. Sharing inventory and information with suppliers and coordinating with them regarding material availability also significantly influence supply chain capability. Moreover, internal integration significantly affects supply chain capability. Customer integration, including information sharing and involving customers in demand forecasting, influences supply chain capability. While supply chain integration (internal, supplier, and customer) does not directly impact operational performance, supply chain capability serves as a significant intervening variable.

Siagian and Johono (2022) explored the influence of supply chain integration on operational performance, mediated by supply chain responsiveness and innovation capability, in food and beverage companies located in East Java, Indonesia. A questionnaire, utilizing a 7-point Likert scale, was distributed through various channels, including social media, email, WhatsApp, and mail posts, to collect data from a sample of 140 companies selected using a probability sampling technique. Data analysis was conducted using Partial Least Squares (PLS) technique with SmartPLS Version 3.0 software. The results showed that supply chain integration positively impacts supply chain responsiveness, innovation capability, and operational performance. Furthermore, supply chain responsiveness and innovation capability were found to positively influence operational performance, mediating the relationship between supply chain integration and operational performance.

Cahyaningratri and Naylah (2023) investigated the effects of supplier integration, internal integration, and relationship management with customers on operational and business performance, while also exploring the mediating role of operational performance. Data were collected from 210 respondents across various industries in Central Java, Indonesia, and analyzed using IBM SPSS Statistics software version 24 and Smart PLS 3.0 (Smart Partial Least Square). Purposive sampling was utilized for data collection through

questionnaire distribution. Results revealed significant positive relationships between supplier integration, internal integration, and relationship management with customers on operational and business performance. Additionally, operational performance was found to mediate the relationship between integration and relationship management variables and business performance.

In Spain, Wang, Chen and Zhang (2022) examined the relationship between supply chain integration and sustainability performance. A meta-analysis approach is employed to analyze data from 60 selected empirical studies focusing on Supply Chain Integration (SCI) – Sustainability Performance (SP) relationship. The findings reveal a positive relationship between SCI and SP, with the strength of the relationship influenced by contextual moderators such as the operationalization of SP construct and control variables including industry sector, economic development, and country's logistics capabilities. The study highlights that SCI has a significant impact on economic SP, with a lesser effect on social SP. Moreover, the relationship between SCI and SP is found to be more robust in the service industry compared to the manufacturing sector.

In Turkey, Hassan (2023) explored the association between various factors of supply chain integration and organizational performance, focusing on dimensions such as internal supply chain process lean practices, technology compatibility, and quality of information sharing. Adopting a qualitative research method, the study sought to elucidate the impact of independent variables on dependent variables through questionnaire-based data collection using a random sampling technique. Data analysis was conducted using SPSS version 25. The research findings shed light on the significance of the independent variables in enhancing organizational performance. The findings indicated that internal supply chain process lean practices, technology compatibility, and quality of information sharing had a significant effect on organizational performance.

In the Jordanian food and beverage industry, Masa'deh, Muheisen and Mohammad (2022) examined the effect of supply chain integration on operational performance. Quantitative research design and regression analysis were employed to empirically validate the

research model using 317 valid survey responses. Results indicate that supply chain integration has a direct and significant effect on operational performance, with all dimensions of the theoretical model contributing significantly. The findings underscore the importance of developing and implementing effective supply chain integration strategies and technologies to enhance performance and competitive advantage.

Thneibat and Al-Mufleh (2023) examined the impact of supply chain integration on strategic performance, with a focus on the mediating role of strategic vigilance, in medium and large-sized industrial companies in Jordan. Supply chain integration, comprising strategic, internal, and external integration, is examined in relation to strategic performance and response. Structural Equation Modeling (SEM) using the AMOS16 program was employed for hypothesis testing and model validation. The results reveal that supply chain integration significantly influences strategic performance and response. Specifically, the study finds that the response of the supply chain mediates the impact of strategic vigilance on strategic performance. The findings show the importance of fostering trust, commitment, and mutual interest among supply chain partners to enhance external integration and improve the responsiveness of the supply chain to market changes.

Al-Nazer (2022) aimed at developing a measurement scale for Supply Chain Integration (SCI) and Firm Performance (FP) tailored to the context of Jordanian Small and Medium-sized Enterprises (SMEs). Drawing on previous studies, a comprehensive survey instrument comprising 46 items was developed and administered to 284 SMEs in Jordan. Exploratory factor analysis was conducted on a sample of 263 responses, resulting in the purification of the scale to 36 items loaded on four factors. The refined measurement scale demonstrated high reliability. Confirmatory factor analysis was subsequently employed to validate the scale, confirming its convergent, construct, and discriminant validity. Fitness indicators for the model indicated its suitability for the SMEs environment in Jordan.

Among Chinese online companies, Zhang, Comite and Matac (2022) studied the influence of supply chain integration and its impact on operating performance. Primary data was collected through a questionnaire distributed to supply chain professionals of the targeted companies. The research instrument was validated through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Subsequently, structural equation modeling (SEM) was employed to evaluate the research hypotheses. The findings suggest that integrating various aspects of the supply chain positively affects operational performance, leading to enhanced financial performance for the companies involved in the integration process.

In Pakistan, Khan (2024) investigated the influence of supply chain integration (supplier, internal, and customer) on operational performance, with a focus on the mediating role of supply chain capabilities in the manufacturing industry of Karachi, Pakistan. Survey data from 175 employees in the SME sector of Karachi were analyzed using Partial Least Square-Structural Equation Modeling. The findings indicate that supply chain integration has a significant positive impact on operational performance. Moreover, supply chain integration enhances operational performance by mediating through supply chain capabilities. These results show the importance of supply chain integration in enhancing performance in the manufacturing sector.

In another study, Junaid, Zhang and Syed (2022) studied the relationship between sustainable supply chain integration, green innovations, and firm performance in the context of manufacturing firms in Pakistan. Drawing on information processing theory and dynamic capability view, a conceptual framework is proposed and empirically tested using primary survey data and secondary data from 296 manufacturing firms across 19 sectors. Structural equation modeling (AMOS 26 and SPSS 25) is employed for data analysis. Results reveal that sustainable internal, supplier, and customer integration positively influence both green managerial and process innovations. Furthermore, green managerial innovation positively impacts firm financial performance, whereas green process innovations have a negative significant influence on firm performance, suggesting potential costs associated with rapid changes in manufacturing processes.

Irfan, Rafiq and Sani (2022) studied the effects of supply chain integration, including information, process, and measurement integration, on operational and business performance in service industries in Pakistan. Additionally, it investigated the contingent effect of IT use, encompassing transaction management, order delivery and customer services, and planning & control, on the relationship between integrative supply chain practices and firm performance. Employing a stepwise hierarchical regression approach and survey data collected from firms in various service sectors, including food, hospitality, fashion, telecom, IT, and retail. The study found that IT use strengthens the effects of SCI on firm performance by moderating this relationship significantly. Our findings underscore the importance of IT in integrating supply chain activities and highlight the pivotal role it plays in both B2B and B2C markets.

Uddin (2022) investigated the influence of supply chain integration and flexibility on operational performance, leveraging the resource-based view theory, in pharmaceutical manufacturing firms located in Karachi, Pakistan. Using a quantitative approach, data was collected from 236 respondents through a structured questionnaire adapted from previous studies. The questionnaire measured multiple dimensions including internal and external information integration, reactive and proactive supply chain flexibility, and operational performance. Regression analysis was employed for hypothesis testing. The results indicate that all proposed hypotheses were supported, with all independent variables demonstrating positive and significant effects on operational performance. While the magnitude of these effects varied across dimensions, all dimensions contributed positively to operational performance improvement.

In Malaysia, Ali, Iranmanesh and Zailani (2022) examined the effect of supply chain integration on halal food supply chain integrity and food quality performance. This study, drawing on the resource-based view (RBV) theory, aims to investigate the effects of supply chain integration (SCI) on halal food supply chain integrity and, subsequently, food quality. Empirical data from 275 halal-certified food companies in Malaysia were analyzed using structural equation modeling in SmartPLS3.0. The findings reveal that SCI, encompassing internal, supplier, and customer integrations, significantly influences

various dimensions of halal food supply chain integrity, ultimately leading to improvements in halal food safety and quality.

In Zimbabwe, Simbarashe, Charumbira and Shumba (2022) examined the effect of supply chain integration on the operational performance in Industrial Development Corporation of Zimbabwe Limited (IDCZ). Adopting a descriptive case study research design, the study employs a mixed-method approach, combining qualitative and quantitative research methods. The sample population comprises 73 employees of IDCZ, with the sample size determined using the Rao soft formula. Data collection involves questionnaires and interviews, distributed using the drop and pick method to minimize disruption during working hours. Data analysis is conducted using SPSS. The results indicate a positive and significant correlation between internal integration, supplier integration, customer integration, logistics integration, information sharing, processing integration, and firm performance. However, the study revealed that IDCZ exhibits minimal supply chain integration with customers, logistics, and information sharing. The study concludes that enhancing supplier integration, internal integration, customer integration, logistics integration, and information sharing will enhance IDCZ's operational performance.

Agyei-Owusu, Nuertey and Acquah (2022) investigated the relationship between dimensions of supply chain integration (SCI), operational performance, and firm performance among firms in Ghana. A research model grounded in theoretical frameworks was developed to analyze the proposed relationships. A survey was conducted among manufacturing and service firms in Ghana, resulting in 120 usable responses. Partial least squares structural equation modeling (PLS-SEM) was employed to analyze the research model. Robustness tests were conducted using logistic regression and the Kruskal Wallis test. The findings indicate that internal integration has positive and significant effects on both customer integration and supplier integration. Moreover, internal integration positively influences firm performance, while customer integration enhances both operational performance and firm performance.

In the Ethiopian Textile Industries, Gamachu and Patrick (2023) assessed supply chain performance integration measurement scale (SCIPS) framework to comprehensively assess supply chain performance in the Ethiopian textile industry. Grounded in performance and supply chain-related theories, the framework provides a holistic approach to evaluating supply chain integration and performance. Professionals from the textile sector self-reported data, and 385 responses were collected through surveys administered via mail or in person. The study aims to develop and validate the SCIPS framework, confirm its factorial design, and assess its psychometric properties. Exploratory and confirmatory factor analyses were conducted to achieve these objectives. Additionally, bias analysis was performed using standard methods. The study sheds light on the current state of supply chain integration in the Ethiopian textile industry and identifies potential areas for improvement.

Omondi (2022) assessed the effect of supply chain integration on the performance of metal and allied sector manufacturing firms in Nairobi City County, Kenya, guided by systems theory. A cross-sectional survey design was adopted with a target of 46 companies, involving 92 respondents from procurement and stores departments. Primary data was collected using a questionnaire. Findings reveal that supply chain integration positively and significantly influences the performance of metal and allied sector manufacturing firms. The study concludes that enhancing linkage with suppliers and implementing automatic ordering systems can mitigate delays and inefficiencies in the supply chain. The findings further indicate that effective coordination and information sharing among supply chain partners improve inventory control, reduce operational costs, and enhance overall firm productivity.

Chirchir (2022) investigated the relationship between supply chain integration implementation and the performance of large manufacturing companies in Kenya. Through a cross-sectional descriptive research design and primary data collected from 94 respondents overseeing supply chain functions in sampled firms, the study employs partial least squares structural equation modeling (PLS-SEM) for data analysis. The findings reveal that supply chain integration has a positive and significant effect on organizational

performance. Additionally, competitive advantage partially mediates the relationship between supply chain integration and firm performance, while environmental dynamism moderates this relationship, with certain factors such as customer uncertainty and government policy negatively impacting firm performance.

Mogaka (2023) investigated the relationship between supply chain integration and competitive advantage in food and beverage manufacturing firms in Kenya, with a focus on the moderating effect of supply chain adaptability. Using a cross-sectional survey design, data were collected from 146 participants representing 73 selected firms. Primary and secondary data were gathered through structured and unstructured questionnaires. The reliability and convergent validity of the measurement instrument were confirmed. The results indicate a positive correlation between functional integration, supplier integration, customer integration, technology integration, and competitive advantage, with supply chain adaptability moderating this relationship. The findings suggest that for every unit increase in integration, competitive advantage is expected to grow.

Mbugua and Okech (2023) examined the influence of internal integration on operational performance in Kenya's level five public hospitals, with a focus on the moderating effect of public procurement. Utilizing a causal and cross-sectional study design, empirical data were collected from 164 supply chain key personnel working in these hospitals through a structured questionnaire. Simple random sampling was employed to select the participants. The analysis revealed a significant relationship between internal integration and operational performance, indicating that changes in internal integration practices contribute to variations in operational performance. Furthermore, public procurement was found to significantly moderate this relationship, suggesting that effective procurement processes enhance the impact of internal integration on operational performance.

2.4.3 Value Chain Mapping

Using systematic review of literature, MacCarthy (2022) examined mapping the supply chain. The study stressed the importance of supply chain mapping, reviews academic

literature on mapping exercises, and defines fundamental elements for creating supply chain maps. A formal hierarchy of supply systems is proposed for mapping at different levels of analysis, illustrated with examples from the textile and apparel industry. Primary and secondary data sources for mapping studies are identified, along with challenges in their utilization. The findings indicated that supply chain mapping is essential for understanding and addressing contemporary challenges in the global economy.

In India, Priyanka and Kandpal (2022) conducted an evaluation of supply chain mapping of green leafy vegetables. The primary objective is to map and understand the performance of the supply chain, including the monetary flow from consumers to farmers through various channels. The study included 40 green leafy vegetable farmers/growers and 20 retailers identified through focus group discussions in Bengaluru, Karnataka. Qualitative data collection methods were employed to map and understand the dynamics of the supply chain, including the flow of money from consumers to farmers. The findings revealed the intricate dynamics of the supply chain of green leafy vegetables in Bengaluru, Karnataka. Factors such as increasing per capita income, health awareness, and urbanization drive the cultivation and distribution of vegetables in the region.

Faisal and Banwet (2019) examined the relationship between mapping supply chains on risk and customer sensitivity dimensions in India. The study proposed a model for selecting supply chain strategies based on customer sensitivity and risk alleviation competency. A graph theoretic approach was utilized to quantify these dimensions for three case supply chains in Indian SME clusters. The model is tested and validated using empirical data, and suitable supply chain strategies are suggested for each case. The findings demonstrated the effectiveness of the proposed model in mapping supply chains based on customer sensitivity and risk alleviation competency. Suitable supply chain strategies were identified for each case, providing valuable insights for organizations in selecting and improving their supply chain strategies.

Otieno (2024) explored the role of supply chain mapping in sustainable procurement among manufacturing firms in Kenya, considering the challenges faced by the sector and

the impact of COVID-19. Using a qualitative and exploratory approach guided by Social Action Theory, the study systematically reviews past literature to unravel the relationship between supply chain mapping and sustainable procurement. The findings indicate that supply chain mapping plays a significant role in enhancing sustainable procurement and supply chain management practices among manufacturing firms in Kenya. The study further revealed that supply chain mapping improves transparency and traceability across supplier networks, enabling firms to identify inefficiencies and reduce risks in procurement processes. Additionally, it was found that supply chain mapping facilitates better coordination and collaboration with suppliers, promoting long-term partnerships and the adoption of environmentally and socially responsible sourcing practices.

Omamo et al. (2025) examined the structure and technological requirements of key agro-processing value chains in Bungoma County, Kenya. The study adopted a value chain analysis research design. The target population comprised stakeholders involved in the herbal, dairy, coffee, and sunflower value chains, including farmers, processors, traders, SMEs, investors, and county officials. The study relied primarily on primary data collected through literature reviews, stakeholder interviews, facility visits, and direct observations of production and processing activities. The research identified several critical factors affecting productivity and efficiency within the value chains. These included post-harvest management practices, access to modern agricultural technologies, availability of processing facilities, irrigation systems, farm machinery, and digital market access solutions. The findings highlighted that improved post-harvest technologies and modern farming practices significantly enhance productivity and efficiency. Furthermore, investment in processing infrastructure, irrigation, and digital market platforms was found to support competitiveness, sustainability, and overall sector growth.

2.4.4 Supply Chain Automation

In the United States, Mohsen (2023) examined the effect of artificial intelligence (AI) on supply chain management performance (SCM). The study utilizes the Scopus database, a comprehensive repository of scholarly literature, to identify relevant research articles on

AI and SCM. Keywords related to AI, SCM, and performance are used to search for relevant publications. The findings indicated that various AI techniques, including machine learning, predictive analytics, and optimization algorithms, enhance SCM performance by enabling data analysis, demand prediction, and route optimization. In addition, AI applications lead to improved responsiveness to demand changes, reduced lead times, and lower operational costs in SCM processes.

In India, Chaudhari (2019) examined the effect of automation technology on logistics and supply chain management. The study adopted a descriptive research design. The findings indicated that automation technology has revolutionized logistics and supply chain management in numerous ways, leading to increased efficiency, cost savings, and improved customer service. Automated guided vehicles (AGVs), robotic arms, and conveyor systems have transformed warehouse operations. AGVs can autonomously transport goods within warehouses, while robotic arms handle picking, packing, and sorting tasks. Automation technologies such as route optimization software and GPS tracking systems streamline transportation operations. These tools help companies minimize fuel consumption, reduce transit times, and enhance overall fleet efficiency.

Weerasinghe (2022) examined the effect of supply chain automation on supply chain delivery of large scale apparel organizations in Sri Lanka. A quantitative empirical study was conducted using a self-designed questionnaire administered to a convenient sample of 65 participants. The reliability of the questionnaire was assessed using Cronbach's Alpha, demonstrating its reliability. The study findings indicated that supply chain automation has an influence on three key areas of organizational supply chain performance: Strategic, Tactical, and Operational. Supply chain automation enables organizations to align their supply chain strategies with broader business objectives. By automating strategic planning processes, such as demand forecasting, capacity planning, and inventory optimization, companies can make more informed decisions that contribute to overall business success.

In India, Andiyappillai (2021) studied automation on supply chain performance in industrial companies, focusing on the challenges and considerations arising from the adoption of automated approaches. Through interviews with representatives from two companies and an interactive process, the study examines the effects of automation on internal synchronization and overall supply chain efficiency. The findings highlight the benefits of automation, including cost reduction, elimination of human errors, and enhanced employee productivity. However, challenges such as interdepartmental cooperation, resource allocation, and time management also emerge as important considerations in the automation process. The study shows the need for companies to carefully assess the implications of automation on their supply chain processes and develop strategies to address potential challenges effectively.

In Southern Zimbabwe, Mazikana (2023) examined the effect of warehouse management systems on the performance of private warehouses measured in terms of cost reduction, competitive capacity, and profitability. The study aims to determine the influence of enterprise resource planning (ERP) on order picking, assess the impact of radio frequency identification (RFID) technology on inventory accuracy, and ascertain the overall impact of WMS on profitability. Data was collected through structured questionnaires and analyzed using descriptive statistics. The findings indicate that effective WMS implementation results in reduced costs, enhances competitive capacity, and improves profitability. Strategic alignment, cultural adaptation, leadership adjustment, and goal incorporation were identified as essential factors for successful WMS adoption.

In Kaimosi University College, Rapando and Juma (2020) conducted a study aimed to investigate the influence of supply chain automation on inventory management. The study employed a descriptive survey design and used a census method to select all targeted respondents involved in inventory management at KAFUCO. Respondents included procurement officers, auditors, financial officers, accountants, ICT officers, storekeepers, and consumer department heads. Systematic questionnaires were used to gather primary information. The study found that electronic store management strongly influenced inventory control. Regression analysis revealed a positive and significant relationship

between electronic store management and inventory control. In addition, electronic supplier management was identified as a significant influencer of inventory control, with a positive and significant relationship indicated by correlation analysis. Also, electronic inventory control also had a significant influence on inventory control, despite a negative correlation with inventory turnover.

Abade, Noor, Namusonge and Wachiuri (2024) looked into the effect of supply chain automation on the performance of food and beverage manufacturing firms in Kenya, and investigated the moderating effect of supplier capability on this relationship. Guided by the Theory of Technology Acceptance Model (TAM), a descriptive survey design was adopted. Primary data was collected from 227 respondents in 68 food and beverage manufacturing firms using structured questionnaires. Reliability and construct validity were tested using Cronbach's alpha and explanatory factor analysis, respectively. Results indicate that supply chain automation has a significant positive effect on firm performance, with supplier capabilities moderating this relationship. The study concludes that food and beverage manufacturing firms in Kenya should prioritize supply chain automation to enhance performance, considering the moderating influence of supplier capabilities.

Among food and beverage manufacturing firms in Kenya, Wanjiru and Noor (2023) investigated the impact of supply chain automation on the performance of, with a focus on the moderating role of supplier capability. The research adopts a descriptive survey design and follows a positivist approach. The population consists of 544 respondents from various departments of 68 food and beverage manufacturing firms in Kenya. A sample of 227 respondents is obtained using simple random sampling. Primary data is collected through a structured questionnaire, and reliability and validity are assessed using Cronbach's alpha and exploratory factor analysis, respectively. The study finds a significant positive effect of supply chain automation on firm performance, with supply chain automation having the highest impact. Additionally, supplier capability moderates the relationship between supply chain automation and firm performance, indicating its importance in enhancing the effectiveness of automation initiatives. The study concludes

that food and beverage manufacturing firms in Kenya should prioritize supply chain automation and invest in developing supplier capabilities to maximize the benefits of automation.

2.4.5 Supplier Capability

An organization's supplier capability can be considered as a main strategic resource or ability for procuring maintainable competitive benefit, and may have important effects on organization's and even supply chain 's performance and competitiveness. Though numerous researchers have revealed that many logistics abilities are confidently related with competitive benefit and/or financial performance, empirical researches have hardly concentrated on China logistics management but mostly have focused on organizations in western advanced countries. There is still inadequate proof to settle that logistics abilities such as process, flexibility and information assimilation capabilities have important effects on organization performance.

Prastia and Nursyamsia (2020) conducted a study on the effect of supply chain operational capability on business performance among small and medium enterprises in Yogyakarta. The study examined how the operational capabilities within the supply chain, including structural, logistical, and technological capabilities, impact the business performance of SMEs in Yogyakarta. A sample of 100 SMEs was selected from a population of 193,391 using a simple random method. The study employed multiple regression analysis to analyze the relationship between supply chain capability and business performance. The results indicated that both collectively and individually, the operational capabilities of the supply chain significantly influence the business performance of SMEs in Yogyakarta. Specifically, structural, logistical, and technological capabilities within the supply chain play a crucial role in enhancing SMEs' business performance.

Kareem (2020) examined the influence of supply chain dynamic capabilities on operational performance in the context of Hungarian manufacturing companies. Using an online survey, data were collected from 208 supply chain management professionals.

Structural equation modeling (SEM) was employed to analyze the relationships between supply chain dynamic capabilities (collaboration, agility, responsiveness, and integration) and operational performance. The findings reveal significant positive associations between collaboration, agility, and responsiveness capabilities with operational performance. However, integration capability was found to have no significant impact on operational performance. The study concludes that developing supply chain dynamic capabilities is essential for manufacturing companies to enhance their operational performance in dynamic environments, emphasizing the multidimensional nature of these capabilities and their varied effects on performance.

In India, Scheer, Miao and Garrett (2020) investigated the impact of supplier capabilities on Original Equipment Manufacturer (OEM) customers' dependence on the supplier and subsequent generation of customer loyalty. Using a sample of purchasing managers focused on a single key component supplier, the study examines three supplier capabilities, two dimensions of customer dependence, and three aspects of customer loyalty. Core offering capability is found to increase the customer firm's benefit-based dependence, while operations capability enhances both benefit-based and cost-based dependence. Benefit-based dependence leads to relational loyalty and, through its effect, to insensitivity to competitive offerings and future purchase expansion. On the other hand, cost-based dependence motivates insensitivity to competitive offerings but does not affect relational loyalty or purchase expansion. Communication capability of the supplier is associated with relational loyalty, independent of customer firm's dependence. The divergent patterns of antecedents and effects of benefit-based dependence and cost-based dependence contribute to a better understanding of their roles in OEM-supplier relationships.

In Zimbabwe, Dhlakuseni (2021) examined the influence of supplier capability on the public procurement and disposal of public assets (PPDPA). The research adopts a mixed-method approach, combining quantitative and qualitative data collection methods. Structured and semi-structured questionnaires, along with a semi-structured interview guide, were utilized to gather data from 205 respondents across various departments

involved in procurement processes. Data analysis was conducted using Statistical Package for Social Sciences (SPSS) Version 20 for quantitative analysis and Amos Version 25 for structural equation modeling. The study findings suggest that strengthening supplier capability has the potential to reduce procurement costs and enhance value for money in the public service delivery system. By improving supplier capability, Zimbabwean state-owned enterprises can optimize their procurement processes and achieve better outcomes in PPDPA.

Wachiuri (2023) examined the influence of supplier capacity on the performance of state corporations in Kenya. A cross-sectional survey design was adopted, employing both quantitative and qualitative approaches. The target population comprised 187 state corporations in Kenya, with a census approach applied for data collection. Questionnaires were utilized to collect primary data. The results of the analysis indicated a positive and significant relationship between supplier capacity and the performance of state corporations in Kenya. Specifically, an increase in supplier capacity was associated with improved performance of these corporations. Supplier capacity plays a crucial role in determining the performance of state corporations in Kenya. Enhancing supplier capacity positively influences the performance of these corporations.

Njuguna and Osoro (2023) aimed to assess the influence of supplier pre-qualification on the performance of petroleum companies in Nairobi City County, Kenya. The study was guided by the Resource-Based View theory and the human capital theory, employing a descriptive research design. The target population comprised 105 procurement, supply chain, and finance managers from 35 petroleum companies in Nairobi. A census technique was used to sample all 105 managers, and primary data was collected using questionnaires. The regression equation revealed that changes in supplier identification and capacity significantly predict improvements in firm performance. Supplier pre-qualification, particularly in terms of identification and capacity, significantly influences the performance of petroleum companies in Nairobi City County, Kenya.

Kiptoo and Miroga (2023) conducted a study on the effect of supplier's technical capability on procurement performance within the County Government of Bomet, Kenya. Employing a descriptive research design, the study targets senior officers involved in procurement decision-making. The census technique was applied to the population, and structured questionnaires were used for data collection. Descriptive and inferential statistics, including mean, frequencies, correlation, and regression analysis, were conducted using SPSS version 24. The findings indicate a significant effect of supplier's technical capability on procurement performance. This implies that improving supplier's technical capability would lead to an improvement in procurement performance.

2.5 Critique of Existing Literature

Numerous studies have explored the relationship between supply chain practices and firm performance across diverse global contexts. For instance, Govindan et al. (2022) examined Supply Chain 4.0 performance measurement in India through a systematic literature review. The study revealed that Industry 4.0 technologies significantly improve supply chain scalability, efficiency, responsiveness, and overall performance. However, these findings might not be directly generalizable to the Kenyan context due to differences in industrial structure, technological adoption, and market conditions.

In the United States, Park and Li (2021) investigated the effect of blockchain technology on supply chain sustainability performance. The study found that blockchain adoption positively influenced environmental protection, social equity, and governance efficiency by improving resource traceability and accountability. However, the research focused on sustainability outcomes rather than overall firm performance, and the study was conducted in a developed country with advanced technological and institutional frameworks, unlike Kenya, which faces different technological and regulatory challenges.

In Nigeria, Adebiyi et al. (2021) examined the effect of supply chain management (SCM) activities on the performance of manufacturing firms in Lagos. The study revealed that SCM practices significantly enhanced customer satisfaction, operational efficiency, and

innovation, thereby improving overall firm performance. The findings also indicated that among the SCM activities, strategic partnerships and effective material flow management were particularly influential in driving firm performance, highlighting the critical role of coordinated and streamlined supply chain operations. However, the study was conducted in Nigeria, and its findings may not be directly generalizable to the Kenyan context due to differences in market conditions, regulatory frameworks, and industrial structures.

Similarly, Anajaa and Esther (2022) assessed the effect of SCM practices on selected FMCG firms in Karu L.G.A., Nigeria, and found that strategic supplier partnership, customer relationship management, and information sharing positively and significantly influenced organizational performance. The study also highlighted that information sharing contributed the most to performance improvements. However, both studies were conducted in Nigeria, and their findings may not be directly transferable to Kenya, where the food and beverage sector faces distinct market, regulatory, and infrastructural conditions.

In Kenya, Odedo and Noor (2024) examined supply chain scalability and performance among distribution firms in Nairobi City County. The study found a strong, significant relationship between supply chain scalability and firm performance. Additionally, the findings indicated that firms with more scalable supply chains were better able to respond to market fluctuations and customer demands, highlighting the strategic advantage of scalable operations in dynamic business environments. However, the research focused solely on distribution firms, limiting its applicability to the manufacturing sector, which faces different operational and scalability challenges.

Similarly, Wakoli and Wachiuri (2025) investigated the influence of supply chain scalability on the performance of distribution firms in Nairobi City County. The study reported that supply chain scalability positively and significantly affects firm performance. The study also revealed that scalability contributed to improved resource utilization and operational efficiency, demonstrating that firms with adaptable supply chain structures can achieve more consistent performance outcomes. Nonetheless, the

study was confined to distribution firms, the current study confines to food and beverage manufacturing firms in Kenya.

2.6 Research Gaps

Although numerous studies have investigated supply chain scalability and their impact on firm performance, most of these studies are sector- or country-specific. For example, Govindan et al. (2022) examined Supply Chain 4.0 performance measurement in India and found that Industry 4.0 technologies significantly improved supply chain scalability, efficiency, responsiveness, and overall performance. Similarly, Park and Li (2021) investigated blockchain adoption in the United States and reported that it positively influenced environmental protection, social equity, and governance efficiency in supply chains. In Nigeria, Adebiyi et al. (2021) assessed manufacturing firms in Lagos and found that SCM practices enhanced customer satisfaction, operational efficiency, and innovation, while Anajaa and Esther (2022) examined FMCG firms in Karu L.G.A. and reported that strategic supplier partnership, customer relationship management, and information sharing positively and significantly influenced organizational performance. However, differences in technological adoption, market dynamics, regulatory frameworks, and sectoral contexts limit the direct applicability of these findings to food and beverage manufacturing firms in Kenya.

In Kenya, Odedo and Noor (2024) examined supply chain scalability and performance among distribution firms in Nairobi City County and found that supply chain scalability had a strong, significant relationship with firm performance, improving responsiveness to market fluctuations and customer demands. Wakoli and Wachiuri (2025) studied the influence of supply chain scalability on the performance of distribution firms in Nairobi City County and reported that scalability positively influenced performance by enhancing resource utilization and operational efficiency. However, these studies were conducted in distribution firms, which differ in operational characteristics, scalability requirements, and performance challenges from food and beverage manufacturing firms.

2.7 Summary of Literature Reviewed

This research was grounded on five theories: adaptive structuration theory (AST), information processing theory (IPT), porter's value chain model, technology acceptance model (TAM), and dynamic capabilities theory. Adaptive structuration theory was used to explain the effect of supply chain agility on the performance of food and beverage manufacturing firms in Kenya. AST emphasizes how organizational members interpret and utilize structural resources, such as distribution flexibility, product innovation, and responsiveness to change, to enhance operational efficiency and competitiveness. Information processing theory was applied to explain how supply chain integration influences organizational performance. IPT highlights the importance of timely, accurate, and well-coordinated information flows across internal and external supply chain partners to improve decision-making, responsiveness, and efficiency. Porter's value chain model was applied to explain the effect of value chain mapping on organizational performance. The model emphasizes how primary and support activities, such as procurement, production, logistics, and customer service, collectively create value, enhance efficiency, and strengthen competitive advantage. Technology acceptance model was applied to explain how supply chain automation influences organizational performance, emphasizing how employees' perceptions of usefulness and ease of use drive the adoption of technologies that improve productivity, accuracy, and process efficiency. Further, dynamic capabilities theory was applied to explain the moderating effect of supplier capabilities on the relationship between supply chain scalability and organizational performance, emphasizing how firms sense opportunities, seize resources, and reconfigure operations to maintain competitiveness in dynamic markets.

Empirical literature demonstrates that supply chain agility, including distribution flexibility, product innovation, and responsiveness to change, significantly enhances the performance of food and beverage manufacturing firms. Studies also reveal that supply chain integration practices, such as IT integration, internal resource coordination, and collaboration with partners, improve information flow, operational efficiency, and responsiveness. Furthermore, studies show that value chain mapping and analysis of

procurement, production, logistics, and distribution activities contribute to reduced operational costs, improved product quality, and enhanced customer satisfaction. Moreover, empirical studies indicate that supply chain automation, including warehouse, document, and tender automation, positively influences operational efficiency, accuracy, and employee productivity. Finally, studies reveal that supplier capabilities, particularly logistics, operational efficiency, and organizational structure, strengthen the impact of supply chain scalability on firm performance by enabling better coordination, resource utilization, and responsiveness to market dynamics.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter presents the research methodology adopted in this study. It explains the research philosophy underpinning the study and the research design applied to achieve the study objectives. The chapter further describes the target population, sample size determination, and sampling techniques used. In addition, it outlines the data collection instruments, data collection procedures, pilot testing of the research instrument, and the methods used for data analysis and presentation of results.

3.2 Research Design

According to Neuman (2022), a research design is a planned and structured investigation developed to obtain answers to a research question or problem. It outlines the essential elements of a study and serves as a blueprint for data collection, coding, and analysis, providing a logical and systematic plan to guide the research process. Similarly, Latwal (2020) describes research design as the "glue" that holds all elements of a study together. Kothari (2023) defines it as the plan and structure conceived to answer research questions, while Kumar (2022) characterizes it as a comprehensive framework that determines the methods and procedures for collecting and analyzing data, thereby creating a structured approach to meet the requirements of the research.

This study adopted both descriptive research design and explanatory research design. Descriptive research design is a systematic approach used to accurately depict the characteristics, behaviors, or conditions of a population or phenomenon as it naturally occurs (Neuman, 2022). It involves collecting and organizing data to identify patterns, trends, and relationships without manipulating variables (Latwal, 2020). This design relies on methods such as surveys, observations, and structured instruments to provide a clear and detailed picture of the subject under study (Babbie, 2021). In the context of this study,

it captures existing supply chain scalability practices and performance in food and beverage manufacturing firms, highlighting operational strengths and challenges. The descriptive design was appropriate for this study because it allowed the researcher to systematically examine how supply chain scalability dimensions are currently implemented across different firms without altering their natural operations.

Explanatory research design, also known as causal research design, is a systematic approach used to investigate cause-and-effect relationships between variables (Babbie, 2021). It aims to determine how one or more independent variables influence a dependent variable and to uncover the mechanisms driving these effects. This design relies on structured data collection and rigorous statistical analysis, often involving hypothesis testing, to validate causal links (Babbie, 2021; Bell, Bryman & Harley, 2022). Explanatory research is particularly useful for understanding complex interactions in real-world contexts, such as the relationship between supply chain scalability, supplier capability, and firm performance in the food and beverage manufacturing sector. By focusing on causal inference, it allows researchers to identify the underlying drivers of performance and operational efficiency. This design was appropriate for the study as it enabled the investigation of how supply chain scalability and supplier capability directly impact firm performance, providing evidence-based insights for managerial decision-making and strategic planning.

3.2.1 Research Philosophy

A research philosophy is a belief about the way in which data regarding a particular phenomenon should be collected and analysed. Saunders, Lewis and Thornhill (2023) point out that research philosophy is important in the development of the research background, research knowledge and its nature. It is defined as the general belief, concepts and attitudes of an individual or a group (Sekaran & Bougie, (2020). Research philosophy encompasses the fundamental beliefs and assumptions that guide a researcher's approach to studying phenomena. Four main types of research philosophies exist: positivism, interpretivism, pragmatism, and realism (Punch, 2020). Positivism emphasizes empirical

observation and experimentation to uncover objective truths, employing quantitative methods and deductive reasoning. Interpretivism, on the other hand, views reality as socially constructed and subjective, focusing on individuals' interpretations and experiences within their social context through qualitative methods. Pragmatism combines elements of both positivism and interpretivism, prioritizing practical outcomes and problem-solving, and utilizing a mix of quantitative and qualitative methods. Realism posits an independent reality but recognizes the influence of human perception, aiming to uncover underlying structures and mechanisms using both quantitative and qualitative approaches. Each research philosophy offers unique perspectives on knowledge acquisition and reality, guiding researchers in selecting appropriate methodologies to address research questions effectively.

The use of positivism philosophy in explaining the effect of supply chain scalability on the performance of food and beverage manufacturing firms in Kenya. Positivism aligns with the need for rigorous and systematic inquiry into the relationship between supply chain scalability and firm performance, emphasizing the use of quantitative data and statistical analysis to uncover objective truths. In the context of food and beverage manufacturing firms in Kenya, positivism allowed the researcher to collect data providing tangible evidence of the impact of supply chain scalability on firm performance. Moreover, positivism facilitates the identification of causal relationships and patterns in the data, enabling researchers to test hypotheses and make predictions about the effects of supply chain scalability on various performance metrics. By employing positivist methods such as questionnaires, researchers can systematically analyze the relationship between supply chain scalability and firm performance, controlling for confounding variables and ensuring the reliability and validity of their findings.

3.3 Target Population

Target population refers to the entire group of individuals, organizations, or units that possess the characteristics of interest for a particular study (Creswell & Creswell, 2023). Field (2021) defines the target population as a complete collection of elements from which

the researcher intends to draw conclusions, sharing similar observable attributes relevant to the research objectives. The unit of analysis in this study was all the food and beverage manufacturing firms in Kenya. According to Kenya Association of Manufacturers (2023), there are 68 food and beverage manufacturing firms in Kenya. These food and beverage manufacturing firms in Kenya were chosen due to their major contribution to the economy in terms of competitive Supply Chain Practices. They are exposed to how competitive environment is done and thus they were a very resourceful tool in the study. The unit of observation was heads of four departments, which include Supply chain and Logistics department, Quality Assurance (QA) and Quality Control (QC) department, Production/Operations Department and Sales and Marketing. The target population for this study comprised 544 heads and assistant heads from four key departments, Supply Chain and Logistics, Quality Assurance and Quality Control (QA/QC), Production/Operations, and Sales and Marketing, across 68 food and beverage manufacturing firms in Kenya.

3.4 Sampling Frame

A sampling frame is a complete list or database of all the units, individuals, or elements in a population from which a sample is drawn for a study (Field, 2021). It serves as the practical representation of the population and ensures that every unit in the population has a chance of being selected. Greene and Dreyer (2021) emphasize that a study should use a sufficiently large sample to ensure that similar findings could be obtained if another sample of the same size were selected. Sampling allows researchers to draw conclusions about the entire population by selecting representative elements. A sampling frame is the list of all population units from which the sample is drawn. In this study, the sampling frame comprised 544 respondents from four key departments, Supply Chain and Logistics, Quality Assurance and Quality Control (QA/QC), Production/Operations, and Sales and Marketing, across 68 food and beverage manufacturing firms in Kenya. From each department, two senior staff members were selected, as they are primarily responsible for decision-making related to supply chain scalability, ensuring that the sample captures the perspectives of key decision-makers.

Table 3.1: Sampling Frame

Category	Population Distribution
Supply chain and Logistics	136
Quality Assurance (QA) and Quality Control (QC)	136
Production/Operations Department	136
Sales and Marketing	136
Total	544

3.5 Sample Size and Sampling Technique

3.5.1 Sample Size

The sample size determines the statistical accuracy of the findings. Sample size is a function of change in the population parameters under study and the estimation of the quality that is needed by the study (Hall, 2020). The sample size of this study was computed based on the following formula as proposed by Borg and Gall (2014):

$$\frac{NZ^2 \times .25}{\lfloor d^2 \times (N-1) \rfloor + \lfloor z^2 \times .25 \rfloor}$$

Where;

n = sample size

N= total population size (known or estimated)

d= precision level (usually .05 or.10)

z= number of standard deviation units of the sampling distribution corresponding to the desired sample size

$$= \frac{544 \times 1.96^2 \times .25}{\lfloor 0.05^2 \times (544-1) \rfloor + \lfloor 1.96^2 \times .25 \rfloor}$$

$$= \frac{522.4576}{\lfloor 1.358 \rfloor + \lfloor 0.961 \rfloor}$$

$$= \frac{522.4576}{2.3185}$$

$$= 225$$

The sample size determination formula yielded 225 respondents. However, since the study targeted four categories of respondents and each category had an equal number of members, the sample size of 225 was not evenly divisible among the four groups. To ensure proportional representation across all categories, the sample size was therefore increased slightly to 228 respondents. This adjustment allowed each department to have an equal number of respondents, facilitating balanced data collection and ensuring that the study's findings accurately reflected the perspectives of all key functional areas within the 68 food and beverage manufacturing firms included in the study.

Table 3.2: Sample Size

Category	Target population	Sample size
Supply chain and Logistics	136	57
Quality Assurance (QA) and Quality Control (QC)	136	57
Production/Operations Department	136	57
Sales and Marketing	136	57
Total	**544**	**228**

3.5.2 Sampling Technique

The study used stratified random sampling to select 228 respondents from the food and beverage manufacturing firms in Kenya. Stratified random sampling is a probability sampling technique where the population is divided into distinct subgroups, or strata, based on shared characteristics, and random samples are drawn from each stratum (Creswell & Creswell, 2023). Its key characteristics include ensuring that each subgroup is proportionately represented and reducing sampling bias, while also allowing for more precise estimates of population parameters (Neuman, 2022). In this study, the strata comprised four departments: Supply Chain and Logistics, Quality Assurance/Quality Control (QA/QC), Production/Operations, and Sales and Marketing. The use of stratified

random sampling was justified because it ensured that all relevant departments were adequately represented in the sample, reflecting the diversity of roles and perspectives in the food and beverage manufacturing firms. By proportionately including respondents from each stratum, the technique enhanced the representativeness of the sample, minimized sampling errors, and allowed the study to accurately capture variations in supply chain practices and performance across different functional areas.

3.6 Data Collection Instruments

This study collected primary data using a semi-structured questionnaire. A semi-structured questionnaire is a data collection tool that combines structured and unstructured questions, allowing for both standardized responses and detailed, qualitative insights from respondents (Latwal, 2020). In this study, the structured questions comprised nominal scale items for collecting demographic information (such as department, position, and years of experience) and 5-point Likert scale items ranging from “strongly disagree” to “strongly agree” to measure perceptions and practices related to supply chain scalability and firm performance. The benefits of closed-ended questions include ease of analysis, consistency across respondents, and the ability to quantify responses for statistical testing (Kumar, 2022). They reduce ambiguity, allow for faster response times, and facilitate comparisons across different groups or departments, which enhances the reliability and validity of the collected data.

Open-ended questions are questions that allow respondents to answer in their own words without being restricted to predefined options, enabling them to provide detailed explanations, opinions, or experiences (Babbie, 2021). They are particularly useful for capturing nuanced insights, exploring new ideas, and understanding complex phenomena that structured questions may not reveal. Their importance lies in providing rich qualitative data that can uncover underlying motivations, perceptions, and contextual factors influencing behavior or decisions. They also allow researchers to identify trends or patterns that may not have been anticipated, contributing to a deeper and more comprehensive understanding of the research problem.

The questionnaire was organized into seven sections to systematically collect data relevant to the study. Section A gathered information on the background of respondents, including demographic and professional characteristics. Sections B to E focused on key supply chain dimensions: supply chain agility, supply chain integration, value chain mapping, and supply chain automation. Section F assessed supplier capability, while Section G measured the performance of food and beverage manufacturing firms in Kenya

3.7 Data Collection Procedure

Data collection refers to the systematic process of gathering information from selected sources to answer research questions and test hypotheses. Before starting, authorization was obtained from Jomo Kenyatta University of Agriculture and Technology, followed by a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). Permission was then sought from the management of the targeted food and beverage manufacturing firms to ensure access and cooperation. Respondents were informed about the purpose of the study and assured of confidentiality. Research assistants and supervisors were trained on administering the questionnaires. A pilot study was conducted to assess the clarity and understanding of the questionnaire items among the Heads of Departments (HODs).

Data were collected using a combination of physical drop-off and pick-up questionnaires and online data collection via Google Forms to improve accessibility and response rates. Cover letters explaining the importance of the study and confidentiality accompanied each questionnaire. Respondents were given three days to complete the instruments, after which completed questionnaires were collected. Follow-ups and reminders were sent to non-respondents, and all participants were thanked for their contribution. Respondents rated their firms' performance relative to competitors over the last three years, ensuring comparative and reliable data for analysis (Mukherjee, 2020; Kumar, 2022).

3.8 Pilot Testing

A pilot study is a small-scale preliminary study conducted before the main research to test and refine the research instruments, procedures, and methodology (Latwal, 2020). It helps identify potential problems, assess feasibility, and ensure that the tools effectively capture the intended data. The pilot test was conducted in food and beverage manufacturing firms in Kenya to evaluate the validity and reliability of the research instrument. The pilot group comprise of 10% of the sample size (23 individuals). According to Babbie (2021), a pilot group should comprise approximately 10% of the intended sample size. This proportion is sufficient to test the research instruments, identify potential issues, and make necessary adjustments without requiring a full-scale study.

3.8.1 Validity of Research Instrument

Validity is the extent to which a research instrument, such as a questionnaire or test, measures what it is intended to measure (Punch, 2020). It is a critical concept in research, as it determines the accuracy and appropriateness of conclusions drawn from the collected data. Validity ensures that the findings are credible and relevant to the research questions (Creswell & Creswell, 2023). This study focused on three types of validity: face validity, content validity, and construct validity. Face validity assesses whether the instrument appears to measure what it is intended to measure, based on a subjective evaluation (Latwal, 2020). In this study, face validity will be enhanced through a pilot test, with unclear or ambiguous questions revised accordingly. Content validity evaluates the extent to which the instrument comprehensively covers the construct or concept under study (Krishna, 2020). Expert opinions from supervisors and professionals in supply chain management sought to ensure the questionnaire fully addresses all relevant aspects of the study variables.

Construct validity examines whether the set of questions accurately measures the theoretical constructs or variables of interest (Hair et al., 2020). Confirmatory factor analysis (CFA) was conducted to test construct validity, ensuring that the items effectively

represent the intended constructs. For acceptable construct validity, items should explain at least 0.5 variance relative to their construct, and the Average Variance Extracted (AVE) for each construct must exceed 0.4 (Greene & Dreyer, 2021). Statistical analyses will be performed using SPSS version 28. Constructs with AVE values below 0.4 was refined by removing items that explain less than 0.5 variance to improve validity.

In addition, a statistical test of sampling adequacy using by Kaiser-Meyer-Olkin (KMO) was used to indicate the proportion of variance in the variables that might be caused by the underlying factors. The value of 1.0 is regarded as useful for factor analysis. Consequently, Bartlett's tests of Sphericity were used to check the hypothesis which states that the correlation matrix is an identity matrix. If the variables are unrelated then it is an indication that they are unsuitable for structure detection. Accordingly, Cohen et al. (2021) recommends that values of less than 0.05 indicate that the data is good for factor analysis.

3.8.2 Reliability of Research Instrument

Reliability is a pointer of a measures' internal consistency (Field, 2021). Before commencement of the main field work, filtering of the measurement scales started with computing reliability coefficient (Cronbach's alphas) in accordance with Greene and Dreyer (2021) recommendations. The questionnaires were pilot tested amongst the respondents in selected firms. These manufacturing firms and HODs were considered to possess characteristics similar to the ones in actual survey. However, respondents from pilot-tested firms were not part of the study as this would have introduced assessment biases. A pilot study sample should be 10% of the projected sample for research. Equally, similar recommendations are by Hair et al. (2020).

Therefore, pilot test for this study consisted of 13 firms a randomly selected. The responses from three HODs in each of the 13 manufacturing firms were coded, summated and entered in the SPSS and a Cronbach alpha (α) coefficient test of reliability were calculated based on a threshold of at least 0.7 as recommended by Babbie (2021). For the purpose of determining the reliability of the study constructs, the Cronbach's alpha test

was conducted on all the scales, using a 0.70 cut-off point which is recommended as commonly acceptable (Bryman, 2022). The closer the Cronbach's alpha is to 1, the higher the internal consistency reliability.

The rationale for the assessment is that the individual items in each scale should all be measuring the same construct and thus be highly inter-correlated. A questionnaire with a good internal consistency should have high alpha coefficients (Bell et al., 2022). The study results indicated that the minimum required Alpha values of 0.70 was exceeded in all the cases, signifying that the instrument used was reliable.

3.9 Data Analysis and Presentation

Data analysis is the process of examining, cleaning, transforming, and interpreting data to extract meaningful insights, identify patterns, and make informed decisions. It involves applying various techniques and methods to explore, summarize, and visualize data (Greene & Dreyer, 2021). The research instrument generated both qualitative and quantitative data. Qualitative data from open ended questions was analyzed by use of thematic analysis. Thematic analysis is a qualitative research method used to identify, analyze, and report patterns or themes within qualitative data (Silverman, 2021). It involves systematically organizing and interpreting textual or visual data to uncover recurring patterns of meaning, ideas, or concepts. The process typically begins with familiarizing oneself with the data through repeated readings or viewings, followed by coding, where segments of data are systematically labeled with descriptive or interpretive codes (Stake, 2020). These codes are then grouped together into broader themes based on similarities and relationships, which are refined and defined through an iterative process of review and discussion. The results are presented in a narrative form.

Data analysis was performed with the aid of Statistical Package for the Social Sciences (SPSS) version 28.0 using both descriptive and inferential statistics. Descriptive analysis is a statistical method used to summarize and describe the basic features of a dataset. It involves organizing, presenting, and interpreting data in a meaningful way to provide

insights into its characteristics and distribution (Devi, 2019). This analysis aims to describe the central tendency, variability, and distributional properties of the data without making inferences or generalizations beyond the dataset itself. Descriptive analysis were done for comparison of means, frequency distribution, standard deviation, skewness and Kurtosis values.

Inferential data analysis is a statistical method used to draw conclusions, make predictions, or test hypotheses about a population based on data collected from a sample of that population (Creswell & Clark, 2021). Unlike descriptive analysis, which focuses on summarizing and describing the characteristics of a dataset, inferential analysis involves making inferences or generalizations about the population from which the sample was drawn. Correlation analysis was used to examine the strength and direction of the relationships between supply chain scalability, supplier capability, and firm performance. Regression analysis was employed to determine the predictive effect of supply chain scalability and supplier capability on firm performance, including testing the moderating role of supplier capability. Together, these analyses allowed the study to quantify associations and establish cause-and-effect relationships among the variables.

3.9.1 Model Specification

Model 1and 2 specified below sought to establish effect of supply chain scalability dimensions variables against firm performance respectively.

$FP = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon$ …….. Model 1

Where:-

Y is dependent variable (firm performance)

X_1 is independent variable # 1 (supply chain agility)

X_2 is independent variable # 2 (supply chain integration)

X_3 is independent variable # 3 (value chain mapping)

X_4 is independent variable # 4 (supply chain automation)

β_0 is a constant

ε is Error term (random variation due to other unmeasured factors).

3.9.2 Moderation

To examine the moderating effect, hierarchical regression analysis was conducted. The procedure followed the guidelines recommended by Hair et al. (2020) for testing interaction effects in regression models. Moderation occurs when the relationship between an independent variable and a dependent variable changes depending on the level of a third variable (the moderator). The analysis was performed in sequential steps. In the first step, the independent variable (X_1) was entered into the regression model to determine its direct effect on the dependent variable (Y). In the second step, the moderator variable (Z), Supplier Capability, was added to the model to assess its direct influence on Y. In the third step, the interaction term (X_1Z), computed as the product of the independent variable and the moderator, was introduced into the model. The model for the moderating effect was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X + \beta_3 X_1 Z + \varepsilon$$

Where;

Y represents the dependent variable,

X_1 represents the independent variable,

Z represents the moderator (Supplier Capability),

β_0 is the intercept,

β_1–β_3 are the regression coefficients, and

ε is the error term.

3.9.3 Underlying Assumptions of Multiple Regression Model

A regression model is a mathematical representation of what and how independent variables are related to the dependent variables. All regression models have assumptions, and violation of these assumptions can lead to unreliable results. The following assumptions that underline multiple regression model of analysis were assessed:

i. Normality assumption plays a fundamental role in many inferential procedures, particularly when conducting parametric tests such as t-tests, ANOVA, and linear regression. Hair et al. (2020) emphasize the importance of assessing normality assumptions, which entail the expectation that scores on continuous variables are distributed symmetrically around the mean, following a bell-shaped curve. To verify normality assumptions, various statistical methods are employed (Bryman, 2022). One commonly used approach involves examining measures of skewness and kurtosis, which assess the degree of asymmetry and the peakedness of the distribution, respectively. Additionally, the Kolmogorov-Smirnov test and Shapiro Wilk test frequently utilized to formally test the normality of a dataset by comparing the observed distribution to a normal distribution. Violations of normality assumptions can lead to biased estimates, inaccurate inferences, and increased risk of Type I or Type II errors in statistical tests.

   Null hypotheses are formulated to be tested against alternative hypotheses to determine the significance of observed data patterns. For the Kolmogorov-Smirnov test, the null hypothesis (H_0) states that the sample data follow a specified distribution, typically assumed to be a normal distribution (Creswell & Creswell, 2023). The alternative hypothesis (H_1), on the other hand, suggests that the sample data do not follow the specified distribution. In the context of the Shapiro-Wilk test, the null hypothesis (H_0) posits that the sample data are drawn from a normally distributed population. The alternative hypothesis (H_1) then asserts that the sample data are not drawn from a normally distributed population. Therefore, for both the

Kolmogorov-Smirnov and Shapiro-Wilk tests, the null hypothesis (H_0) implies that the data conform to a normal distribution. If the p-value associated with these tests is less than the chosen significance level (often denoted as α), typically 0.05, the null hypothesis is rejected, indicating that there is sufficient evidence to conclude that the data do not follow a normal distribution. Conversely, if the p-value is greater than α, the null hypothesis is retained, suggesting that there is not enough evidence to reject the assumption of normality.

ii. Linearity is a crucial assumption that pertains to the relationship between the dependent variable and independent variables within a regression model. As defined by Field (2021), linearity denotes the extent to which changes in the dependent variable can be attributed to corresponding changes in the independent variables. To assess linearity, researchers commonly employ Pearson's product-moment correlation coefficient (PPMC), which quantifies the strength and direction of linear relationships between variables. By computing PPMC for each pair of variables, researchers aim to evaluate the degree to which the relationship between the dependent variable and each independent variable adheres to a linear pattern. Linearity refers to the degree to which the change in the dependent variable is related to change in the independent variables (Greene & Dreyer, 2021). Linearity between the dependent variable and each independent variable was tested using PPMC. The goal was to assess the strength of linear relationships among variables.

iii. Homoscedasticity, a crucial assumption in regression analysis, posits that the variance of the dependent variable remains constant across all levels of the independent variable. This implies that the spread of data points around the regression line is consistent throughout the range of values for the independent variable (Hair et al., 2020). To assess homoscedasticity, researchers commonly employ the Levene's test for equality of variances. This statistical test evaluates whether the variance of the residuals, which represent the differences between observed and predicted values, remains constant across different levels of the independent variable. The null hypothesis for the Levene's test asserts that the variances of the residuals are equal across groups or levels of the independent

variable. Conversely, the alternative hypothesis suggests that the variances of the residuals differ significantly among groups or levels. By testing for homoscedasticity, researchers aim to ensure the validity of regression analysis results and the appropriateness of statistical inferences. When homoscedasticity is present, regression models can accurately estimate the relationship between the dependent and independent variables, as the spread of data points around the regression line remains consistent. However, violations of homoscedasticity, indicated by significant results from the Levene's test, may lead to biased parameter estimates and unreliable inferences.

iv. Multi-collinearity is a phenomenon in regression analysis characterized by high correlations between independent variables, which can lead to inflated standard errors, unstable parameter estimates, and reduced interpretability of regression coefficients (Bryman, 2022). In the present study, multi-collinearity was evaluated through the examination of tolerance and Variance Inflation Factor (VIF) values. Tolerance measures the proportion of variance in a particular independent variable that is not explained by other independent variables in the model. Conversely, VIF represents the degree to which the variance of an estimated regression coefficient is inflated due to multi-collinearity. According to guidelines proposed by Hair et al. (2020) and Leech et al. (2011), tolerance values below 0.10 or VIF values exceeding 10 are indicative of severe multi-collinearity issues.

Assessing multi-collinearity is essential for ensuring the reliability and validity of regression analysis results. When multi-collinearity is present, the interpretation of regression coefficients becomes challenging, as it becomes difficult to disentangle the unique contributions of individual independent variables to the dependent variable (Devi, 2019). Additionally, multi-collinearity can inflate standard errors and undermine the precision of parameter estimates, leading to erroneous conclusions. By examining tolerance and VIF values, researchers can identify problematic levels of multi-collinearity and take appropriate corrective actions, such as removing highly correlated variables or employing alternative modeling techniques, to improve the accuracy and robustness of their regression models.

v. In linear regression analysis, the assumption of no autocorrelation is crucial, as it ensures that the residuals, which represent the differences between observed and predicted values, are independent of each other (Greene & Dreyer, 2021). Autocorrelation occurs when the residuals exhibit systematic patterns or dependencies over time, violating the assumption of independence. This phenomenon can lead to biased parameter estimates, inflated standard errors, and unreliable inferences, compromising the validity of regression analysis results. To assess autocorrelation, the Durbin-Watson test is commonly employed, which evaluates whether the residuals exhibit serial correlation by comparing their successive differences. The Durbin-Watson statistic ranges from 0 to 4, with values close to 2 indicating no autocorrelation, values below 2 suggesting positive autocorrelation, and values above 2 indicating negative autocorrelation.

   By conducting the Durbin-Watson test, researchers can ascertain the presence of autocorrelation in the residuals and determine the appropriateness of linear regression analysis. When autocorrelation is detected, corrective measures such as data transformation or inclusion of lagged variables may be necessary to address the issue. Ensuring the absence of autocorrelation is essential for obtaining reliable and unbiased estimates of regression coefficients, facilitating accurate interpretations of relationships between independent and dependent variables. Therefore, by rigorously testing for autocorrelation, researchers can enhance the validity and robustness of their regression models, leading to more meaningful and accurate statistical inferences.

3.9.4 Hypothesis Testing

Multiple regression analysis was used to predict the value of dependable variable based on the value of two or more independent variables. The study hypotheses were therefore tested using multiple regression analysis where the significant level was set at 0.05. The null hypotheses were therefore rejected if the p-value were less than the selected level of significance (0.05) and alternative accepted.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Introduction

The chapter encompasses the analysis, presentation, interpretation of findings, and discussion pertaining to the study's objectives. Data analysis involved the utilization of descriptive statistics, including frequencies, percentages, mean, and standard deviation, to analyze the data. Also, open ended questions were analyzed using content analysis and the findings presented in prose form. The first section provides the study response rate followed by a summary of the demographic statistics of the respondents selected for the study. In the third section, a comprehensive overview of the summary statistics for the study variables' related questions is presented.

4.2 Response Rate

The sample size for the study was 228 respondents from the food and beverage manufacturing firms in Kenya for the study. Out of 228 questionnaires that were distributed, 196 questionnaires were returned, checked for accuracy and completeness, and deemed valid for analysis, yielding a response rate of 85.96%, as presented in Table 4.1. According to Sekaran and Bougie (2016), a response rate of 50% and above is considered adequate, 60% and above is good, and 70% and above is excellent. Therefore, the achieved response rate of 85.96% is excellent and sufficient for reliable analysis and reporting.

Table 4.1: Response Rate

Questionnaire	Frequency	Percent
Returned	196	85.96
Non returned	33	14.47
Total	**228**	100.00

4.3 Demographic Information Analysis

The general information of the study respondents is presented in this section. It focuses on the data collected on work experience, and length of service in the manufacturing firm. The findings obtained from the analysis of this demographic information were presented and discussed in the sub-sections that follow.

4.3.1 Respondents' Work Experience

The findings regarding the work experience distribution among the respondents are presented in Figure 4.1. The findings showed that 27.1% of the respondents had work experience of 5-10 years, 24.1% 10-15 years, 19.9%1-5 years, 16.3% 15 years and above and 12.6% less than 1 year. These results indicate that the majority of the respondents have work experience ranging from 5 to 15 years, with the highest proportion falling within the 5-10 years category (27.1%). Existing literature widely recognizes that work experience plays a crucial role in individuals' expertise, knowledge, and skill development in their respective fields. Experienced employees often bring valuable insights, problem-solving abilities, and decision-making skills to their organizations (Attaran, 2020). Additionally, employees with longer work experience may have developed extensive networks, industry-specific knowledge, and a deep understanding of organizational processes (Muthoni & Mose, 2020). Organizations can leverage this diversity in work experience to foster knowledge sharing, mentorship, and collaboration across different experience levels, leading to enhanced performance and organizational effectiveness (Adeniyi & Adeeko, 2024).

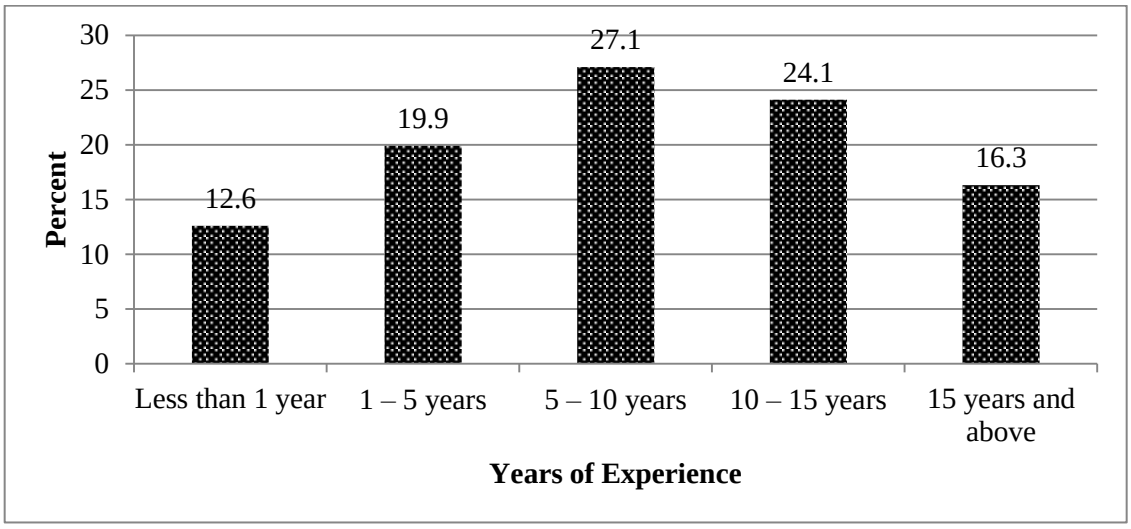

Figure 4.1: Distribution of Respondents Based on Work Experience

4.3.2 Respondents' Length of Service in their Organization

The study sought to establish the distribution of respondents based on their length of service in the organization. Figure 4.2 presents summary of the findings obtained. The findings show that respondents who had worked in food and beverage manufacturing firms in Kenya for 1-5 years were 35.9%, for 5-10 years 29.3%, for less than 1 year were 15.2%, and those who had worked for 10-15 years were 13.0% and 15 years and above were only 6.5%. These results provide insights into the distribution of respondents based on their length of service in the organization showing that majority of respondents (35.9%) had 1-5 years of service, while a significant portion (29.3%) had been with the organization for between 5 and 10 years. Studies have highlighted the importance of employee tenure and its impact on job satisfaction, commitment, and organizational citizenship behaviors (Mwaiwa, 2024). Employees with longer tenures tend to develop a deeper understanding of the organizational culture, processes, and norms, which can contribute to higher levels of job satisfaction and commitment (Nyaga et al., 2021). These individuals often have established relationships within the organization, which can facilitate communication, collaboration, and knowledge sharing. On the other hand,

employees with shorter tenures may bring fresh perspectives, enthusiasm, and the potential for innovation (Adeniyi & Adeeko, 2024).

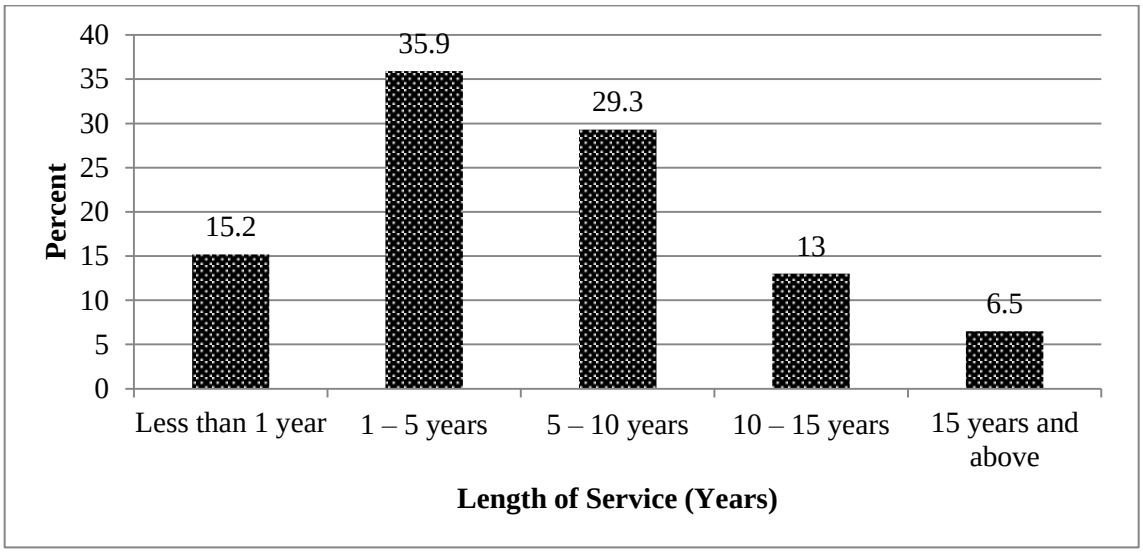

Figure 4.2: Respondents Years of Service in the Organization

4.4 Pilot Test and Validity of Instrument

A pilot study serves as a rehearsal of the main survey, assessing the appropriateness of the proposed methods and the validity and reliability of the research instruments (Kothari, 2004). Prior to the main data collection, the research instrument was pilot tested using Google Forms, which were distributed to respondents via company emails. The pilot study involved administering structured questionnaires to 23 respondents from food and beverage manufacturing firms in Kenya, representing approximately 10% of the total sample size. Conducted in September 2022, the use of email ensured a 100% response rate and allowed efficient data collection across geographically dispersed firms. The collected data were entered into SPSS version 28 for analysis. During the preliminary stage, survey responses were carefully examined for errors or missing data, and all completed questionnaires accounted for 100% of the data collected.

4.4.1 Validity Results

Construct validity assesses the extent to which a measurement instrument accurately captures the theoretical construct it is intended to measure. In this study, construct validity was evaluated using the Average Variance Extracted (AVE), which reflects the proportion of variance in the items explained by their underlying construct. An AVE value of 0.50 or higher is considered acceptable, indicating that the construct explains at least 50% of the variance in its items (Fornell & Larcker, 1981). As shown in Table 4.2, the AVE values for the five constructs, Supply Chain Agility (0.501), Supply Chain Integration (0.584), Value Chain Mapping (0.517), Supply Chain Automation (0.558), and Supplier Capability (0.546), all exceed the recommended threshold. This indicates that the items within each construct are highly correlated and effectively represent the intended theoretical concept, demonstrating good convergent validity.

Table 4.2: Construct Validity Results

Variables	Average Variance Explained	No. of Items
Supply Chain Agility	0.501	9
Supply Chain Integration	0.584	9
Value Chain Mapping	0.517	9
Supply Chain Automation	0.558	9
Supplier Capability	0.546	8

The researcher conducted Principal Component Analysis (PCA) to select and assess the final items of the constructs for subsequent statistical and hypothesis testing (Hair et al., 2021). To evaluate the adequacy of the sample for analysis, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity were employed (Table 4.3). The KMO statistic, which ranges from 0 to 1, assesses sampling adequacy, with values above 0.7 considered acceptable. In this study, KMO values ranged from 0.664 to 0.794, indicating that most constructs had adequate sample adequacy, while Supply Chain Integration (0.664) was slightly below the ideal threshold but still acceptable for exploratory analysis. Bartlett's Test of Sphericity examines whether the correlation matrix is significantly different from an identity matrix, with significance values below 0.05 indicating

suitability for factor analysis. All constructs had Bartlett's test significance values of 0.000, confirming the validity and appropriateness of the collected responses for the study. The PCA results support the theoretical conceptualization of the constructs, with a summary presented in Table 4.2.

Table 4. 3: KMO & Bartlett's Test of Sphericity

Indicators	KMO Measure	Bartlett's Test of Sphericity (χ^2)	Sig.
Supply Chain Agility	.794	363.625	.000
Supply Chain Integration	.664	149.165	.000
Value Chain Mapping	.725	484.020	.000
Supply Chain Automation	.715	446.711	.000
Supplier Capability	.782	223.464	.000

4.4.2 Reliability Results

Cronbach's Alpha is a statistical measure that assesses the internal consistency of a set of items, summarizing how closely related they are as a group. The reliability of each construct in this study was evaluated using Cronbach's Alpha coefficient, with mean scores and standard deviations extracted (Table 4.4). The results show that all constructs have acceptable reliability, with Cronbach's Alpha values ranging from 0.740 to 0.964. Specifically, Supply Chain Agility and Value Chain Mapping both scored 0.838, Supply Chain Integration scored 0.740, Supply Chain Automation scored 0.836, and Supplier Capability scored 0.964. These values exceed the minimum threshold of 0.70 suggested by Nunnally (1978), indicating that the items within each construct are consistent and reliably measure the intended concept. A higher Cronbach's Alpha, closer to 1.0, reflects greater internal consistency among items, ensuring that the constructs used in this study provide accurate and reliable measurement.

Table 4. 4: Reliability Test Results

Variables	Cronbach's Alpha	No. of Items	Comment
Supply Chain Agility	.838	9	Acceptable
Supply Chain Integration	.740	9	Acceptable
Value Chain Mapping	.838	9	Acceptable
Supply Chain Automation	.836	9	Acceptable
Supplier Capability	.964	8	Acceptable

4.5 Descriptive Analysis of Study Variables

In this section, the study presents summary of findings on questions asked to the respondents on various statements relating to each objective of the study. This includes Likert scale questions which were analysed using means and standard deviation and open-ended questions which was analysed using content analysis and presented in prose form. They used a 5-point Likert scale where 1-strongly disagree, 2-disagree, 3-moderate, 4-agree, 5-strongly agree. The means and standard deviations were used to interpret the findings where a mean value of 1-1.4 was strongly disagree, 1.5-2.4 disagree, 2.5-3.4 neutral, 3.5-4.4 agree and 4.5-5 strongly agree. Standard deviation greater than 2 was considered large meaning responses were widely spread out and not tightly clustered around the mean.

4.5.1 Supply Chain Agility

The first objective of the study was to determine the effect of supply chain agility on performance of food and beverage manufacturing firms in Kenya. Respondents were therefore asked their level of agreement with statements that relate to the influence of Supply Chain Agility on performance of food and beverage manufacturing firms in Kenya. Table 4.5 presents summary of the findings obtained.

The results indicate that respondents generally agreed with the statements related to supply chain agility and its impact on performance. Specifically, respondents showed a high level of agreement (64.7%) with the statement that process integration has a high degree of

process interconnectivity between the network members (M=3.835, SD= 1.054). This finding aligns with the study by Jean (2024) which emphasizes the importance of collaborative relationships and integration among supply chain partners in achieving agility. Furthermore, majority respondents agreed (57.9%) that effectively integrating the supply chain and forging close and long-term relationships with customers and suppliers contribute to performance (M= 3.79, SD= 0.933). This finding is consistent with study by Hultberg and Pal (2021) highlighting the significance of strong relationships and collaboration with supply chain partners in enhancing operational and financial performance.

The agile capabilities of supply chain network are also due to adaptable capabilities, such as, collaboration with third-party logistics (3PL) and other supply chain partners to reduce lead time and improve delivery of products/services. Supply chain alignment can directly impact performance of manufacturing firms but particularly in the HSC network design, the mediating role of leadership cannot be ignored. Supply chain adaptability stems from flexibilities produced by structural and relational investments and choices (Oluwagbade & Odumbo (2025), whereas product innovation capability is more focused and specific. As such, supply chain adaptability provides a context for the development and refinement of a firm's product innovation capability.

Respondents also recognized the importance of innovative products and unstable demand as drivers of agile supply chains, with 51.3% agreeing with this statement as shown by a mean of 3.705 (SD= 0.807). This aligns with Wang et al., (2016) who emphasized the need for flexibility and responsiveness to changing market demands through innovative product offerings. In addition, majority respondents agreed (55.5%) with the statement that delivering value to customers, being ready for change, valuing human knowledge and skills, and forming virtual partnerships contribute to supply chain agility (M=3.671, SD= 0.873). This finding is in line with study by Oshilalu (2024) emphasizing the role of customer-centricity, adaptability, and collaboration in achieving supply chain agility.

Furthermore, respondents recognized the significance of velocity in today's competitive and changing business environment, with 42.9% agreeing with this statement (overall mean= 3.653, SD= 0.664). This finding is supported by literature by Swafford et al., (2016) who highlighted the need for speed and responsiveness to meet customer demands and stay competitive in dynamic markets. The findings also indicated that 52% of respondents agreed that an organization's ability to respond rapidly to changes in demand, in terms of both volume and variety, contributes to enhanced performance (overall mean= 3.643, SD= 0.814). This result underscores the importance of agility in supply chain management, allowing firms to quickly adjust their operations, production, and distribution strategies based on changing market conditions (Ranaiefar & Ritchie, 2023). Rapid responsiveness to demand fluctuations enables organizations to meet customer needs efficiently and maintain a competitive advantage.

The majority of respondents (55.9%) agreed or strongly agreed that producing a diverse range of products that are low-cost, high-quality, and delivered with short lead times contributes to improved performance (overall mean= 3.574, SD= 0.888). This finding is consistent with that of Gunasekaran et al., (2020) highlighting the significance of agile manufacturing practices, such as lean production and quick response capabilities, in enabling organizations to offer customized products efficiently and effectively. The ability to provide products that align with individual customer specifications enhances customer satisfaction and market competitiveness. The results further showed that respondents agreed (overall mean= 3.536, SD= 0.572) with the importance of setting targets for lead times and working towards reducing them, specifically focusing on "Order to Fulfillment" lead time. This finding supports the literature emphasizing the significance of lead time reduction as a key aspect of supply chain agility (Gunasekaran et al., 2017). Shorter lead times enable organizations to improve operational efficiency, minimize inventory costs, and respond promptly to customer demands, leading to enhanced performance outcomes.

Finally, a considerable most of respondents (46.5%) agreed that being closely connected to end-user trends contributes to supply chain agility and improved performance (overall mean= 3.512, SD= 0.708). This finding aligns with the literature highlighting the

importance of market sensitivity and customer-centricity in achieving supply chain agility (Jean, 2024). Organizations that actively monitor and adapt to market trends can better align their strategies, product offerings, and supply chain operations with customer preferences, resulting in improved performance and market competitiveness.

Overall, the aggregate score indicates that respondents held a positive perception (mean = 3.658) regarding the influence of supply chain agility on the performance of food and beverage manufacturing firms in Kenya. These finding align with the existing literature by Chebichii et al. (2021) which emphasizes the importance of supply chain agility in enhancing operational performance, customer satisfaction, and overall organizational competitiveness. The findings highlight the need for food and beverage manufacturing firms in Kenya to focus on developing agile supply chain capabilities to effectively respond to changing market dynamics, customer preferences, and technological advancements.

Table 4.5: Descriptive Statistics on Supply Chain Agility

Statement	**SD**	**D**	**N**	**A**	**SA**	**Mean**	**Std. Dev.**
	%	**%**	**%**	**%**	**%**		
Process integration — it has a high degree of process interconnectivity between the network members.	1.8	7.1	11.8	64.7	14.7	3.835	1.054
Effectively integrating supply chain and forging close and long term relationship with customers and suppliers.	3.6	7.7	12.8	57.9	17.9	3.79	0.933
Innovative products and unstable demand typify agile supply drivers.	4.5	6.4	20.5	51.3	17.3	3.705	0.807
Delivering value to customers, Being ready for change, valuing human knowledge And skills, and forming virtual partnership	4	8.1	18.5	55.5	13.9	3.671	0.873
Organizations achieve the velocity that is needed to be Agile in today's competitive and changing business environment.	1.5	15.3	19.9	42.9	20.4	3.653	0.664

Statement	SD %	D %	N %	A %	SA %	Mean	Std. Dev.
ability of an organization to respond rapidly to changes in demand, both in terms of volume and variety	1.5	9.2	25	52	12.2	3.643	0.814
Produce a broad range of low-cost, high quality products with short lead times in varying lot sizes, built to individual customer specification	2.6	9.7	23.6	55.9	8.2	3.574	0.888
Setting target for lead times and then working towards reducing those lead times specially "Order to Fulfillment" lead time	4.6	14.3	24	37.2	19.9	3.536	0.572
Market sensitive — it is closely connected to end-user trends	1.2	15.1	26.2	46.5	11	3.512	0.708
Aggregate Score						**3.658**	**0.813**

Key: 1-strongly disagree (SD), 2-disagree (D), 3-moderate (N), 4-agree (A), 5-strongly agree (SA)

Respondents were also asked to indicate other ways they think supply chain agility influences their firm performance. Respondents provided different aspects of supply chain agility and its impact on firm performance. They emphasized the importance of supply chain agility in meeting customer demands and maintaining satisfaction. One respondent said: "*Supply chain agility allows us to quickly adapt to changing customer demands and market trends, ensuring that we can meet their needs effectively and maintain customer satisfaction."*

They also highlighted the role of supply chain agility in minimizing lead times and improving customer service. Sentiments of one respondent were: *"One of the key benefits of supply chain agility is the ability to minimize lead times, which enables us to deliver products to customers faster. This has helped us improve our customer service and gain a competitive edge in the market."* They also emphasized on collaboration and strong relationships with suppliers and customers. Another respondent said: *"By collaborating closely with our suppliers and customers, we have been able to build strong relationships and foster trust."* This not only improves the flow of information and materials within the

supply chain but also enhances overall performance as they work together towards common goals.

Flexibility and adaptability were highlighted as essential in today's dynamic business environment. They explained that flexibility is crucial in today's dynamic business environment. One of the respondents indicated,

"Supply chain agility allows us to adjust our production and distribution processes based on demand fluctuations, enabling us to optimize resource utilization and reduce costs while maintaining high-quality standards." Another respondent emphasized the importance of supply chain agility in managing risks and uncertainties: *"Having an agile supply chain has helped us to effectively manage risks and uncertainties."* By being responsive and adaptable, respondents explained that they were able to mitigate disruptions, such as supplier shortages or unexpected changes in market conditions, which ultimately protects their performance and profitability.

4.5.2 Supply Chain Integration

The second objective of the study was to assess the effect of supply chain integration on performance of food and beverage manufacturing firms in Kenya. Respondents were therefore asked their level of agreement with statements that relate to the influence of Supply Chain Integration on performance of food and beverage manufacturing firms in Kenya. Table 4.6 presents summary of findings obtained.

The findings show that the respondents agreed on the internal Integration statement that: each department is now connected via the same IT infrastructure to increase efficiency. The high agreement percentage (55.7%) and mean score (3.837) suggest that respondents recognize the importance of internal integration through IT infrastructure in enhancing efficiency. This finding is consistent with Kis and Shah (2019) that emphasizes the role of internal integration in improving coordination, information sharing, and operational performance within organizations. Respondents also agreed on external integration that

each company in the same supply chain joins hands and works together to achieve the same goal to satisfy the customer's requirements. The significant agreement percentage (54.9%) and mean score (3.826) indicate that respondents acknowledge the benefits of external integration and collaboration among supply chain partners. This aligns with the study by Jokipii (2025) that highlighted the positive impact of external integration on supply chain performance, including improved coordination, reduced lead times, enhanced customer satisfaction, and increased competitiveness.

The considerable agreement percentage (58.2%) and mean score (3.794) imply that respondents' value joint knowledge creation among supply chain partners. They agreed that joint knowledge creation is the extent to which supply chain partners develop a better understanding of and response to the market and competitive environment. This finding is supported by Hellani and Exposito (2021) emphasizing the importance of knowledge sharing and collaboration in supply chains for better market responsiveness, innovation, and competitive advantage. The findings also showed that respondents agreed (M=3.74) that external integration allow for organizations to compete better on cost, by eliminating wasted time and materials, and having fewer middlemen. This finding suggests that while supply chain integration may offer opportunities to improve cost competitiveness, there may be differing opinions among respondents. Study by Anajaa and Esther (2022) highlighted the potential benefits of supply chain integration in cost reduction through streamlined processes, reduced waste, and improved coordination among supply chain partners.

Regarding functional integration respondents agreed that each department in the same company works together to reduce costs. The agreement percentage (55.2%) and mean score (3.731) indicate the recognition of the importance of functional integration within organizations to achieve cost reduction objectives. Functional integration involves collaboration and coordination among different departments to optimize processes and improve overall efficiency (Odedo, & Noor 202). Respondents also agreed that supply chain integration is creating cohesion and increasing connectivity throughout the entire value chain. The agreement percentage (67.6%) and mean score (3.724) indicate a strong

consensus on the importance of supply chain integration in creating cohesion and connectivity across the value chain. This finding aligns with Li et al., (2022) who highlights the role of supply chain integration in improving information flow, collaboration, and overall supply chain performance.

Respondents also agreed that external integration allow organizations to respond faster to changes in the market and stake claims to new markets for an early advantage. The agreement percentage (54.4%) and mean score (3.693) suggest that respondents recognize the potential of supply chain integration to enable faster responses to market changes and facilitate market expansion. This finding corresponds with that of Wakoli and Wachiuri (2025) emphasizing the role of supply chain integration in enhancing agility, adaptability, and market responsiveness. Further, they agreed that a raw materials supplier might collaborate with one or more transport companies to generate service and cost benefits for its largest manufacturing customers. The relatively high agreement percentage (54.2%) and mean score (3.687) indicate the recognition of the benefits of collaboration between suppliers and transport companies. This finding is supported by findings of Adebiyi et al. (2021) that emphasized the advantages of supplier-transport collaboration in improving service quality, cost efficiency, and customer satisfaction.

Furthermore, the respondents were in agreement that resource sharing is the process of leveraging capabilities and assets and investing in capabilities and assets with supply chain partners. The agreement percentage (61.7%) and mean score (3.583) suggest that respondents acknowledge the importance of resource sharing among supply chain partners. This finding aligns with literature that emphasizes the benefits of resource sharing, such as enhanced flexibility, reduced costs, and improved competitiveness through collaborative resource utilization (Park & Li, 2021).

The aggregate score of 3.735 with a standard deviation of 0.914 indicates an overall positive perception of the impact of supply chain integration on firm performance among the respondents. Numerous studies have demonstrated the positive effects of supply chain integration on various performance measures. For example, Govindan et al. (2022)

research showed that supply chain integration enhances operational efficiency, reduces costs, improves customer satisfaction, and increases overall firm competitiveness. These benefits arise from improved coordination, information sharing, collaboration, and resource utilization among supply chain partners.

Table 4.6: Descriptive Statistics on Supply Chain Integration

Statement	SD %	D %	N %	A %	SA %	Mean	Std. Dev.
Internal Integration: each department is now connected via the same IT infrastructure to increase efficiency.	1	6.4	18.7	55.7	18.2	3.837	0.891
External Integration: each company in the same supply chain joins hands and work together to achieve the same goal to satisfy the customer's requirements.	1.5	9.2	14.4	54.9	20	3.826	0.882
Joint knowledge creation is the extent to which supply chain partners develop a better understanding of and response to the market and competitive environment	2.8	9.9	10.6	58.2	18.4	3.794	0.939
Allow for organizations to compete better on cost, by eliminating wasted time and materials, and having fewer middlemen.	4.7	6.7	17.3	52.7	18.7	3.74	0.837
Functional Integration: each department in the same company works together to reduce costs.	1.5	6	23.9	55.2	13.4	3.731	0.877
Supply chain integration is creating cohesion and increasing connectivity throughout the entire value chain,	1.8	9.4	12.4	67.6	8.8	3.724	1.109
Allow organizations to respond faster to changes in the market, and stake claims to new markets for an early advantage.	0.9	11.2	19.5	54.4	14	3.693	0.85
A raw materials supplier might collaborate with one or more transport companies to generate service and cost benefits for its largest manufacturing customers	0.6	16.8	12.3	54.2	16.2	3.687	0.849
Resource sharing is the process of leveraging capabilities and assets and investing in capabilities and assets with supply chain partners.	2.3	17.1	9.7	61.7	9.1	3.583	0.992
Aggregate Score						**3.735**	**0.914**

Respondents were further asked to indicate other ways in which supply chain integration influence their firm performance. One common theme that emerged is the improvement

in collaboration and communication within the organization. By connecting different departments through a unified IT infrastructure, supply chain integration enables seamless coordination and faster decision-making. According to one respondent, "*Integration allows us to share real-time information with our partners, helping us coordinate better and respond quickly to market changes."* This enhanced collaboration enhances overall efficiency and enables the organization to align its activities more effectively.

Another significant benefit highlighted by the participants is the positive impact on customer satisfaction. Supply chain integration allows firms to better understand customer demands and tailor their products and services accordingly. By doing so, they can deliver personalized solutions and meet specific customer requirements, ultimately resulting in higher satisfaction levels. Respondents emphasized the importance of faster order fulfillment, improved delivery processes, and the ability to provide exceptional customer experiences through integrated supply chains.

Streamlining operations and reducing costs were also cited as crucial advantages of supply chain integration. The integration process eliminates redundant processes, optimizes inventory management, and minimizes waste, ultimately leading to operational efficiency and cost savings. By collaborating closely with suppliers and distributors, organizations can eliminate unnecessary intermediaries and negotiate better prices, resulting in improved financial performance. Respondents also emphasized the increased flexibility and adaptability that supply chain integration provides. By integrating their supply chains, firms can quickly respond to changing market conditions, such as fluctuations in demand or the introduction of new products. This flexibility enables them to navigate uncertainties effectively and ensure uninterrupted supply, minimizing disruptions and maximizing customer satisfaction.

Furthermore, supply chain integration fosters innovation and enhances a firm's competitive advantage. Collaboration with supply chain partners enables joint innovation and the introduction of new products or technologies. By leveraging shared knowledge and expertise, organizations can stay ahead of industry trends and develop innovative

solutions to address customer needs. This allows them to differentiate themselves from competitors and gain a competitive edge.

The responses from the participants demonstrated a positive perception of the impact of supply chain integration on firm performance. The integration process brings benefits such as improved collaboration, enhanced customer satisfaction, streamlined operations, increased flexibility, and innovation. These findings align with those of Cannas et al., (2023) and Chen et al., (2019) which emphasizes the significant role of supply chain integration in driving performance improvements.

4.5.3 Value Chain Mapping

The third objective of the study was to find out the effect of value chain mapping on performance of food and beverage manufacturing firms in Kenya. Respondents were therefore asked their level of agreement with statements that relate to the influence of Value Chain Mapping on performance of manufacturing firms. Table 4.7 presents summary of the findings obtained.

The majority of respondents (78.1%) agreed on that statement that value chain mapping depict product flow from inputs to final market (overall mean= 3.964). This indicates that value chain mapping is considered effective in visualizing and understanding the flow of products throughout the value chain. Value chain mapping helps in identifying the sequence of activities involved in the production process and enables firms to identify areas for improvement. This finding aligns with previous research by Omamo et al. (2025) that emphasizes the significance of visualizing product flow to enhance operational efficiency. Majority of respondents (81.6%) agreed with this statement that present value chain governance by different types of connecting arrows showing variant governance patterns associated with separate market channels (overall mean= 3.921). It suggests that value chain mapping enables the depiction of governance structures and relationships within the value chain, particularly concerning different market channels. By illustrating the governance patterns, firms gain insights into the coordination mechanisms and

decision-making processes required for effective value chain management. This finding resonates with that of Dacha et al. (2023) which highlighted the importance of understanding and managing value chain governance for improved performance.

On statement that value chain mapping describes the value chain structure and relationships, majority respondents' (67.4%) were in agreement with this statement (overall mean= 3.814) indicating that value chain mapping is perceived as a valuable tool for describing the structure and relationships within the value chain. It helps firms gain a comprehensive understanding of the interconnected activities, participants, and dependencies within the value chain network. By visualizing these relationships, organizations can identify areas for collaboration, cost reduction, and performance improvement. This finding aligns with that of Porter et al. (2021) which emphasized the importance of understanding value chain structure and relationships for achieving competitive advantage.

A majority of the respondents (74.4%) agreed that value chain mapping help identify gaps or bottlenecks in production flow (overall mean= 3.808). This indicates that mapping facilitates the identification of inefficiencies, delays, or constraints within the value chain that hinder smooth flow. By identifying and addressing these bottlenecks, firms can enhance their operational efficiency and reduce lead times. This finding agrees with previous studies by Mogaka (2023) that highlight the importance of identifying and eliminating bottlenecks for improved supply chain performance. The majority of respondents (67.4%) also agreed with the statement that value chain mapping define clearly market channels in a vertical manner culminating at end markets at the top of the map (overall mean= 3.743). Value chain mapping helps firms define and understand the market channels in a vertical manner, from inputs to end markets. It provides a clear depiction of the flow of products, services, and information through the different stages of the value chain. This understanding enables firms to align their strategies and activities with market demands, ultimately leading to improved performance. This finding is consistent with that of Miao (2021) that emphasizes the significance of market channel alignment for enhanced competitiveness.

In addition, the majority of respondents (72.9%) agreed with this statement that the transportation lead time and the transit time for transportation scheduling are determined using the route (overall mean= 3.732). Value chain mapping facilitates the determination of transportation lead time and transit time by considering the specific routes involved. This knowledge is crucial for effective transportation scheduling, enabling firms to optimize their logistics operations and meet customer expectations. This finding is in line with the literature that emphasizes the importance of transportation planning and scheduling for efficient supply chain management (Ayvaz, 2024).

Further, the statements that “Backward scheduling determines a material-availability deadline or transportation" received a mean score of 3.635. The relatively high percentage of respondents agreeing (56.9%) suggests that backward scheduling is recognized as a valuable approach for determining deadlines related to material availability and transportation. This finding aligns with Mogaka (2023) who highlights the importance of backward scheduling in supply chain management. Backward scheduling allows firms to work backward from the desired delivery date to determine when materials should be available or transportation should be scheduled, thereby ensuring timely delivery and efficient resource allocation.

The statement "Mapping is too simplistic a tool to describe the business enabling environment and its impact on value chains" obtained a mean score of 3.515. The relatively high percentage of respondents expressing agreement or strong agreement (42.7%) indicates that some participants view value chain mapping as a limited tool for capturing the complexity of the business enabling environment and its impact on value chains. This finding is consistent with that of Adeoye (2012) which acknowledges that while value chain mapping provides valuable insights, it may not capture all the intricacies and external factors that influence the performance of value chains. Additional methodologies and tools may be necessary to comprehensively understand the broader business environment.

The statement "Scheduling deadline that lies in the past, the system automatically carries out forward scheduling to determine a delivery deadline that can be confirmed" received a mean score of 3.505. The relatively high percentage of agreement (53.6%) suggests that forward scheduling is perceived as a beneficial approach for determining delivery deadlines. By considering the current status and working forward, firms can adjust schedules to meet the desired delivery date. This finding aligns with that of Agan (2011) who recognized forward scheduling as an effective method to optimize production and delivery processes, ensuring that deadlines are met and customer expectations are fulfilled.

The aggregate score for all the statements related to value chain mapping was 3.737, with a standard deviation of 0.858. This indicates an overall positive perception of the influence of value chain mapping on firm performance among the respondents. These findings are consistent with existing literature by Aghimien and Robert (2022) that emphasized the positive effects of value chain mapping on operational efficiency, risk management, collaboration, and decision-making within the value chain.

Table 4.7: Descriptive Statistics on Value Chain Mapping

Statement	**SD**	**D**	**N**	**A**	**SA**	**Mean**	**Std. Dev.**
	%	**%**	**%**	**%**	**%**		
Depict product flow from inputs to final market	0.7	7.2	13	52.9	26.1	3.964	0.896
Present value chain governance by different types of connecting arrows showing a variant governance pattern associated with separate market channels.	2.1	5.8	10.5	61.1	20.5	3.921	1.007
Describe the value chain structure and relationships	4.6	6.7	11.9	56.2	20.6	3.814	0.915
Help identify gaps or bottlenecks in production flow	2.9	6.4	16.3	55.8	18.6	3.808	0.895
Define clearly market channels in a vertical manner culminating at end markets at the top of the map.	1.1	11.8	19.8	46.5	20.9	3.743	0.734

Statement	SD %	D %	N %	A %	SA %	Mean	Std. Dev.
The transportation lead time and the transit time for transportation scheduling are determined using the route.	1.2	13.4	12.2	57.3	15.9	3.732	0.909
Backward scheduling determines a material-availability deadline or transportation-	1.2	13.8	16.8	56.9	11.4	3.635	0.893
Mapping is too simplistic a tool to describe the business enabling environment and its impact on value chains.	4.1	15.8	21.1	42.7	16.4	3.515	0.636
Scheduling deadline that lies in the past, the system automatically carries out forward scheduling to determine a delivery deadline that can be confirmed	3.6	12.2	22.4	53.6	8.2	3.505	0.839
Aggregate Score						**3.737**	**0.858**

Respondents were further asked their opinion on how else they think value chain mapping influence their firm performance. One significant aspect highlighted by the respondents is the enhanced visibility and understanding of the value chain. One participant noted, "*Value chain mapping helps us identify hidden inefficiencies and areas for improvement. It provides a holistic view of our operations, enabling us to streamline processes and eliminate waste."* This sentiment was echoed by other respondents who emphasized that value chain mapping enables them to identify cost-saving opportunities, optimize resource allocation, and enhance operational efficiency.

Another prominent theme was the identification and mitigation of risks and vulnerabilities within the value chain. A respondent commented, *"Value chain mapping allows us to proactively identify potential bottlenecks and vulnerabilities in our supply chain. By understanding the interdependencies between different stages and stakeholders, we can develop contingency plans and mitigate risks."* The ability to anticipate and address disruptions through value chain mapping was seen as a crucial factor in maintaining a resilient and agile supply chain.

Respondents also highlighted the impact of value chain mapping on collaboration and relationship management. One participant stated, *"Value chain mapping facilitates collaboration with our suppliers and partners. It helps us identify opportunities for joint problem-solving, innovation, and continuous improvement."* By visualizing the relationships and dependencies within the value chain, firms are able to foster stronger partnerships, align their goals, and improve overall coordination and communication.

Strategic decision-making and performance measurement were additional areas emphasized by respondents. A participant noted, *"Value chain mapping provides us with valuable insights for strategic decision-making. It helps us identify areas for differentiation, assess the value-added activities, and align our resources accordingly."* Several respondents also mentioned that value chain mapping enables them to track and measure performance indicators, enabling data-driven decision-making and continuous performance improvement.

Overall, respondents recognized value chain mapping as a powerful tool with far-reaching impacts on firm performance. As one participant summarized, *"Value chain mapping is instrumental in optimizing our operations, mitigating risks, fostering collaboration, and supporting strategic decision-making. It ultimately enhances our competitiveness and customer satisfaction."* The responses highlight the multifaceted benefits of value chain mapping, aligning with the existing literature that emphasizes its significance in improving performance across various dimensions of the value chain.

4.5.4 Supply Chain Automation

The fourth objective of the study was to analyze the effect of supply chain automation on performance of food and beverage manufacturing firms in Kenya. Respondents were therefore asked their level of agreement with the statements that relate to the influence of Supply Chain Automation on performance of food and beverage manufacturing firms in Kenya. Table 4.8 presents summary of the findings obtained.

The respondents' average mean score for this statement (ERP systems incorporate best practices software, reflecting the vendor's interpretation of the most effective way to perform each business process) was 3.87, indicating a generally positive perception of the incorporation of best practices in ERP systems. Additionally, 53.7% of the respondents strongly agreed with this statement, indicating a significant level of acceptance. This finding aligns with the literature by Cahyaningratri and Naylah (2023) which emphasizes that ERP systems provide organizations with pre-configured modules that incorporate industry best practices.

With an average mean score of 3.784, this statement (The system allows shoppers to browse online catalogs, add items to a shopping cart, and submit payments electronically) indicates that automation enables firms to offer an online shopping experience. Moreover, 60.5% of the respondents agreed or strongly agreed with this statement, highlighting the importance of e-commerce and the use of automated systems to provide a seamless online purchasing experience for customers. This finding is consistent with that of Cannas (2023) that recognizes the growing significance of e-commerce and automation in enhancing customer satisfaction and expanding market reach.

On the statement that the organizations use electronic data interchange (EDI) to manage supply chain management processes; this statement received an average mean score of 3.781, indicating a positive perception of the utilization of electronic data interchange (EDI) among the respondents. Furthermore, 55.6% of the respondents agreed or strongly agreed with this statement, highlighting the importance of EDI in improving supply chain coordination and information sharing. The literature also supports the role of EDI in enhancing supply chain performance and collaboration (Gunasekaran et al., 2017). With a mean score of 3.78, respondents agreed on the statement that automatic order tracking leads to a personalized customer experience with minimal manual intervention; this statement indicates that automation in order tracking positively influences the customer experience. Additionally, 51.3% of the respondents agreed or strongly agreed with this statement, emphasizing the value of automated systems in providing real-time updates and personalized services to customers. This finding aligns with that of Faisal and Banwet

(2019) which highlights the role of automation in enhancing customer satisfaction through improved order visibility and communication.

The statement automation keeps customers updated on order statuses in real time and enables businesses to better serve customers received an average mean score of 3.756, suggesting a positive perception of automation's ability to provide real-time order updates. Moreover, 54.5% of the respondents agreed or strongly agreed with this statement, indicating the significance of real-time information sharing in serving customers effectively. The study by Chaudhari (2019) also emphasized the positive impact of real-time communication on customer satisfaction and loyalty. Respondents also agreed with an average mean score of 3.751 that fully-integrated, comprehensive suite of ERP business tools and capacity across all back-office functions; this statement suggests that organizations utilize a fully-integrated suite of ERP tools to streamline back-office functions. Additionally, 51.3% of the respondents agreed or strongly agreed with this statement, highlighting the importance of integrating multiple functions within an organization. The study finding by Chirchir (2022) supports the benefits of integrating ERP systems to enhance operational efficiency and resource management.

In addition, the statement that the systems allow sales forecast figures for various products, and the operational plan is derived from the sales plan received an average mean score of 3.749, indicating the significance of using automated systems to derive operational plans from sales forecasts. Moreover, 55.9% of the respondents agreed or strongly agreed with this statement, emphasizing the importance of accurate sales forecasting and its impact on operational efficiency. The study by Chowdhury et al. (2023) recognized the value of sales forecasting in optimizing resource allocation and production planning. With a mean score of 3.746, respondents also agreed that an automated online ordering system is a point of communication that businesses can use to provide updates to customers during the entire order management. This statement highlights the role of automated online ordering systems as a means of communication and customer updates. Additionally, 55% of the respondents agreed or strongly agreed with this statement, emphasizing the importance of automated systems in maintaining transparent and efficient

order management processes. Desel et al. (2014) supported the use of automated systems as effective communication channels to enhance customer satisfaction and order visibility.

In addition, ERP systems connect to real-time data and transaction data in a variety of ways. These systems are typically configured by systems integrators. This statement received an average mean score of 3.633, indicating the use of ERP systems to connect to real-time and transactional data. Although the mean score is slightly lower compared to other statements, 48.1% of the respondents agreed with this statement. Dhlakuseni (2021) emphasized the role of ERP systems in integrating data from various sources to enable real-time decision-making and enhance operational performance.

The findings regarding the effect of supply chain automation on the performance of food and beverage manufacturing firms in Kenya provide support for the positive impact of automation on various aspects of business operations as shown by an aggregate mean of 3.761 (SD= 0.861). The study findings align with those of Dubey et al. (2023) that supply chain automation is more efficient, accurate, and cost-effective than manual labor. Companies need superior decision-making tools and workflows that can leverage the available data, and, in real time, maximize performance of these sub-processes and the entire supply chain.

Table 4.8: Descriptive Statistics on Supply Chain Automation

Statement	**SD**	**D**	**N**	**A**	**SA**	**Mean**	**Std. Dev.**
	%	**%**	**%**	**%**	**%**		
ERP systems incorporate best practices software reflects the vendor's interpretation of the most effective way to perform each business process	3.7	6.2	13	53.7	23.5	3.87	0.889
The system allows shoppers to browse online catalogs, add items to a shopping cart and submit the payments electronically	2.1	4.2	20	60.5	13.2	3.784	0.974
The organizations use electronic data interchange (EDI) to manage supply chain management processes.	0.6	12.4	13.5	55.6	18	3.781	0.884

Statement	SD %	D %	N %	A %	SA %	Mean	Std. Dev.
Automatic order tracking leads to a personalized customer experience with minimal manual intervention.	0.7	9.3	20	51.3	18.7	3.78	0.81
Automation keeps customers updated on order statuses in real time, and enables businesses to better serve customers.	0.6	5.1	26.1	54.5	13.6	3.756	0.87
Fully-integrated, comprehensive suite of EPR business tools and capacity across all back office functions.	4.7	8.3	15	51.3	20.7	3.751	0.822
The systems allow sales forecast figures for the various products and operational plan is derived from sales plan	1	12.8	13.3	55.9	16.9	3.749	0.885
An automated online ordering system produces is a point of communication that businesses can use to provide updates to customers during the entire order management	0.5	6.9	23.8	55	13.8	3.746	0.872
ERP systems connect to real–time data and transaction data in a variety of ways. These systems are typically configured by systems integrators,	1.9	17.7	13.9	48.1	18.4	3.633	0.742
Aggregate Score						**3.761**	**0.861**

Respondents were further asked their opinion on other ways they think supply chain automation influences their firm performance. Supply chain automation is recognized by respondents as a transformative factor in firm performance, as highlighted in their responses to the open-ended question on its influence. One prominent theme emerging from the participants' feedback is the improved efficiency and productivity brought about by automation. By streamlining processes and reducing manual errors, automation has significantly enhanced operational efficiency. As one respondent noted, *"Supply chain automation has significantly increased our operational efficiency by streamlining processes and reducing manual errors."* Another participant highlighted that automation enables them to handle a larger volume of orders without compromising quality, leading to increased productivity.

The respondents also emphasized the accuracy and reliability benefits of supply chain automation. Automated systems have improved inventory management, ensuring optimal stock levels and minimizing stockouts. This heightened accuracy enables firms to meet customer demands effectively. In the words of a respondent, *"Automated systems have improved the accuracy of inventory management, ensuring that we always have the right stock levels and minimizing stockouts."* Furthermore, the ability to analyze data and generate reports in real-time empowers firms to make informed decisions promptly, increasing overall reliability.

Cost reduction and cost savings emerged as another key impact of supply chain automation. Participants reported optimizing their supply chains and reducing costs in areas such as inventory holding, order processing, and transportation. Automation also helps allocate resources more efficiently, resulting in significant cost savings. *"Automation has helped us optimize our supply chain, leading to cost reductions in areas such as inventory holding, order processing, and transportation,"* explained a respondent. By automating repetitive tasks, firms can lower labor costs and allocate resources more effectively.

Respondents recognized the positive impact of supply chain automation on customer service. Through automation, firms can provide faster order fulfillment, accurate delivery tracking, and better respond to customer needs. This leads to improved customer satisfaction and loyalty. *"Supply chain automation has enabled us to provide faster order fulfillment and accurate delivery tracking, enhancing our customer service experience,"* shared one respondent. Another participant highlighted that automation allows for better anticipation of customer needs, personalization of offerings, and timely responses. Risk management also emerged as a significant benefit of supply chain automation. Automated systems provide real-time visibility and monitoring, enabling firms to proactively identify and address potential risks. With improved risk management capabilities, firms can minimize disruptions and maintain business continuity. As one respondent noted, *"Automated systems provide real-time visibility and monitoring of the supply chain, allowing us to identify and address potential risks proactively."*

Lastly, supply chain automation offers firms a competitive advantage. By enabling faster time-to-market, agility in adapting to market changes, and the ability to offer innovative solutions, automation sets firms apart from their competitors. *"Automation has given us a competitive edge by enabling faster time-to-market, agility in adapting to market changes, and the ability to offer innovative solutions,"* emphasized a respondent. The ability to deliver products efficiently, reduce lead times, and stay ahead of competitors contribute to overall market competitiveness.

The findings from the respondents' feedback align with existing literature, by Gunasekaran et al., (2017) which underscores the benefits of supply chain automation in optimizing operations, enhancing decision-making, and driving overall business performance. These include improved efficiency, accuracy, cost reduction, customer service, risk management, and gaining a competitive advantage. Collectively, these responses highlight the transformative role of supply chain automation in shaping firm performance and positioning organizations for success in a dynamic business landscape.

4.5.5 Supplier Capability

The fifth objective of the study was to determine the moderating effect of supplier capability on the relationship between supply chain scalability (supply chain agility, supply chain integration, value chain mapping and supply chain automation) and performance of food and beverage manufacturing firms in Kenya. Respondents were therefore asked to indicate the extent to which the following supply capabilities are used in their manufacturing firms. Table 4.9 presents summary of the findings obtained. The findings regarding the supplier capabilities in the context of food and beverage manufacturing firms in Kenya reveal the extent to which these capabilities are utilized. The mean score of 3.721 (SD = 0.835) indicates a large extent level of utilization of supplier capabilities among the respondents.

The presence of direct computer-to-computer links with key supply chain partners is perceived to have a significant impact, with a mean score of 3.849. This suggests that the

utilization of digital connectivity with partners is recognized as an important aspect of supply chain management (Giannakis & Mishra, 2022). Establishing such links enables real-time information sharing, enhancing collaboration and responsiveness in the supply chain. In addition, the capability of seamlessly connecting the IT system with those of supply chain partners is also considered valuable, as indicated by a mean score of 3.764. This finding aligns with the literature emphasizing the importance of IT system compatibility and integration for effective supply chain coordination and collaboration (Hassan, 2023).

On the statement, the presence of rules, procedures, and policies provided by the company, as indicated by a mean score of 3.744, suggests a large extent of formalized guidelines for managing supply chain relationships. Such guidelines contribute to standardization, consistency, and efficiency in supply chain operations (Christopher, 2016). In addition, the compatibility of the firm's IT system with those of supply chain partners is perceived as important to a large extent (mean = 3.743). This finding emphasizes the need for technological alignment to facilitate seamless information exchange and integration of systems within the supply chain network (Gunasekaran et al., 2017).

Further, the successful utilization of time-based logistics solutions, such as continuous replenishment, quick response, and Just-in-Time, is acknowledged with a mean score of 3.73. This finding resonates with the literature highlighting the significance of time-based strategies in improving supply chain efficiency and responsiveness (Ibrahim & Samad, 2011). In addition, the perception of having better IT infrastructure than competitors is large extent (mean = 3.669). A robust IT infrastructure enhances a firm’s ability to achieve competitive advantage by facilitating seamless information flow and coordination across the supply chain (Gunasekaran et al., 2017).

The study also found that the integration of operations with customers and/or suppliers through interlocking programs and activities is seen as large extent important (mean = 3.64). This finding aligns with the literature highlighting the value of operational integration in fostering collaboration, coordination, and mutual benefits within the supply

chain (Jermsittiparsert, 2022). Also, the existence of active programs to capture the experience and expertise of individuals and transfer knowledge throughout the organization is large extent acknowledged (mean = 3.626). This highlights the importance of knowledge management and learning within the supply chain context (Kamau, 2013).

A large extent utilization of supplier capabilities indicates that firms in the food and beverage manufacturing industry in Kenya recognize the value of leveraging these capabilities to improve their supply chain operations. The utilization of supplier capabilities enables firms to establish effective collaboration, coordination, and integration with their supply chain partners (Kareem, 2020). This facilitates seamless information sharing, efficient logistics management, and improved responsiveness to customer demands. Moreover, supplier capabilities contribute to enhancing supply chain agility, enabling firms to quickly adapt to changing market conditions and customer requirements (Gunasekaran et al., 2017).

Table 4.9: Descriptive Statistics on Supplier Capability

Statement	**1**	**2**	**3**	**4**	**5**	**Mean**	**Std. Dev.**
	%	**%**	**%**	**%**	**%**		
There are direct computer-to-computer links with our key supply chain partners	1.7	8.4	15.6	52	22.3	3.849	0.845
Our IT system can be seamlessly connected with those of supply chain partners	0.6	6.9	23.6	53.4	15.5	3.764	0.845
The company provides a number of rules, procedures and policies	0.6	11.4	14.8	59.7	13.6	3.744	0.949
Our IT system is compatible with those of our supply chain partner	4.3	4.3	20.9	54	16.6	3.743	0.859
The firm successfully utilizes time-based logistics solutions like continuous replenishment, quick response and Just-in-Time with customers and/or suppliers.	4	5.2	19.5	56.3	14.9	3.73	0.895
We have better IT infrastructure than most of our competitors	1.8	14.2	16	51.5	16.6	3.669	0.798

Statement	1 %	2 %	3 %	4 %	5 %	Mean	Std. Dev.
The firm successfully integrates operations with customers and/or suppliers by developing interlocking programmes and activities.	2.6	9	22.2	54	12.2	3.64	0.845
The firm has active programmes to capture the experience and expertise of individuals and transfer this knowledge throughout the organization.	1.7	16.2	20.1	41.9	20.1	3.626	0.644
Aggregate Score						**3.721**	**0.835**

Key: 1-Not at all, 2-small extent, 3-moderate extent, 4-large extent and 5- very large extent

Respondents were also asked to indicate other ways they think supplier capabilities influence their firm performance. Respondents provided valuable insights into the ways in which they believe supplier capabilities influence their firm performance. The impact of supplier capabilities extends beyond mere product delivery, encompassing various aspects of business operations. One recurring theme in the responses is the importance of reliable and efficient supplier relationships. Participants emphasized the significance of suppliers who consistently meet quality standards, adhere to delivery schedules, and provide timely support. As one respondent noted, *"Having suppliers that can deliver high-quality products on time is crucial for our production efficiency and customer satisfaction."*

The role of supplier capabilities in fostering innovation and product development was also highlighted. Participants recognized the value of suppliers who contribute their expertise, collaborate in problem-solving, and offer innovative solutions. This enables firms to introduce new products or improve existing ones, as expressed by one respondent: *"Working with suppliers who bring innovative ideas and technologies helps us stay ahead in the market and meet evolving customer demands."* Supply chain resilience emerged as a key aspect associated with supplier capabilities. Respondents acknowledged the

importance of suppliers who have contingency plans in place, robust risk management strategies, and the ability to navigate disruptions. Such capabilities provide a sense of security and minimize the negative impact of unforeseen events on the firm's operations and reputation. As one respondent mentioned, *"Having suppliers with strong resilience and backup plans ensures continuity in our supply chain even during challenging times."*

Cost efficiency and competitiveness were also identified as outcomes of effective supplier capabilities. Respondents highlighted the significance of suppliers who offer competitive pricing, favorable terms, and value-added services. This enables firms to optimize costs, enhance profitability, and maintain a competitive position in the market. One participant stated, *"Partnering with suppliers who provide cost-effective solutions gives us a competitive advantage and allows us to offer competitive pricing to our customers."* In addition, effective communication and collaboration with suppliers were emphasized as crucial factors. Participants recognized the importance of open lines of communication, mutual trust, and shared goals. Building strong relationships with suppliers fosters collaboration, enables effective problem-solving, and facilitates joint decision-making processes. As one respondent stated, "*Having a collaborative relationship with our suppliers ensures smooth operations, reduces conflicts, and promotes mutual growth*."

4.6.6 Performance of Food and Beverage Manufacturing Firms in Kenya

The primary aim of this study was to investigate the impact of supplier capability as a moderating factor on the relationship between supply chain scalability and the performance of food and beverage manufacturing firms in Kenya. Having discussed supply chain scalability and the moderating effect of supplier capability in previous sections, this part of the study focuses on assessing the performance of food and beverage manufacturing firms in Kenya from 2018 to 2022. Performance was evaluated based on key indicators including market share, lead time, and operational costs.

4.4.6.1 Market Share

The study collected data on the level of performance experienced by food and beverage manufacturing firms in the last five years in terms of market share from 2018 to 2022. Figure 4.3 presents a trend in market share. The findings of the study reveal a positive trend in the market share of food and beverage manufacturing firms in Kenya from 2018 to 2022. The market share increased steadily over the five-year period, starting at 20% in 2018 and reaching 27% in 2022. This suggests that these firms were able to expand their market presence and capture a larger share of the industry over time.

These findings are consistent with the literature that emphasizes the importance of supply chain scalability and supplier capability in enhancing firm performance. Supply chain scalability enables firms to respond effectively to changing market demands and adapt their operations to accommodate growth (Karikari, 2016). Supplier capability, on the other hand, refers to the capacity of suppliers to provide high-quality products, reliable delivery, and value-added services (Katebi et al., 2022). Additionally, the study conducted by Li et al. (2022) highlighted the significant role of supplier capability in enhancing firm performance, particularly in the context of supply chain management.

The increasing market share observed in this study can be attributed to the effective management of supply chain scalability and the presence of capable suppliers. By ensuring the scalability of their supply chains, these food and beverage manufacturing firms were able to meet customer demands efficiently, optimize their operations, and gain a competitive edge in the market. Moreover, the strong supplier capability likely contributed to the firms' ability to deliver high-quality products and meet customer expectations consistently.

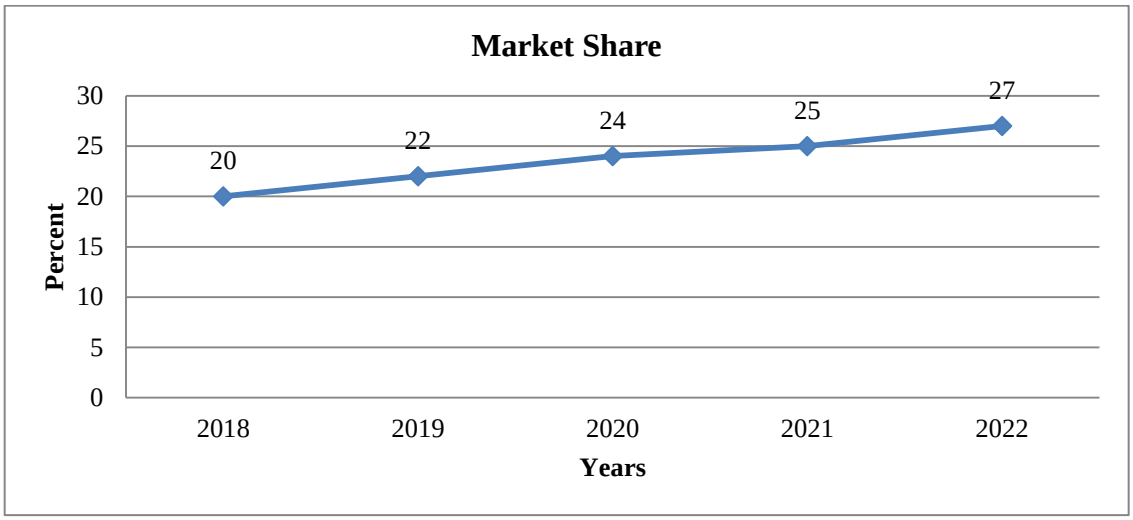

Figure 4.3: Trend Analysis in Market Share

4.4.6.2 Lead Time

The study also measured performance in terms of lead time. The study collected data on the level of performance experienced by food and beverage manufacturing firms in the last five years in terms of lead time from 2018 to 2022. Figure 4.4 presents a trend in lead time. The findings regarding lead time in the food and beverage manufacturing firms in Kenya show a consistent improvement over the five-year period, with a reduction in lead time from 10 days in 2018 to 7 days in 2021 and 2022. This indicates an improvement in the efficiency and speed of the supply chain operations in terms of order fulfillment and delivery. The consistent reduction in lead time over the years indicates that the food and beverage manufacturing firms in Kenya have made efforts to streamline their supply chain processes and enhance operational efficiency. This improvement in lead time can positively impact customer satisfaction, order fulfillment, and overall business performance.

A shorter lead time is often associated with improved customer satisfaction and increased competitiveness in the market. According to a study by Manzoor et al. (2022), reducing lead time can lead to enhanced customer responsiveness and increased market share. It allows companies to fulfill customer orders more quickly and meet their demands in a

timely manner. The decrease in lead time can be attributed to various factors such as improved production processes, better inventory management, and enhanced coordination with suppliers and logistics partners. Implementing supply chain practices that focus on reducing lead time, such as just-in-time (JIT) or lean manufacturing principles, can contribute to the achievement of shorter lead times (Mazikana, 2023).

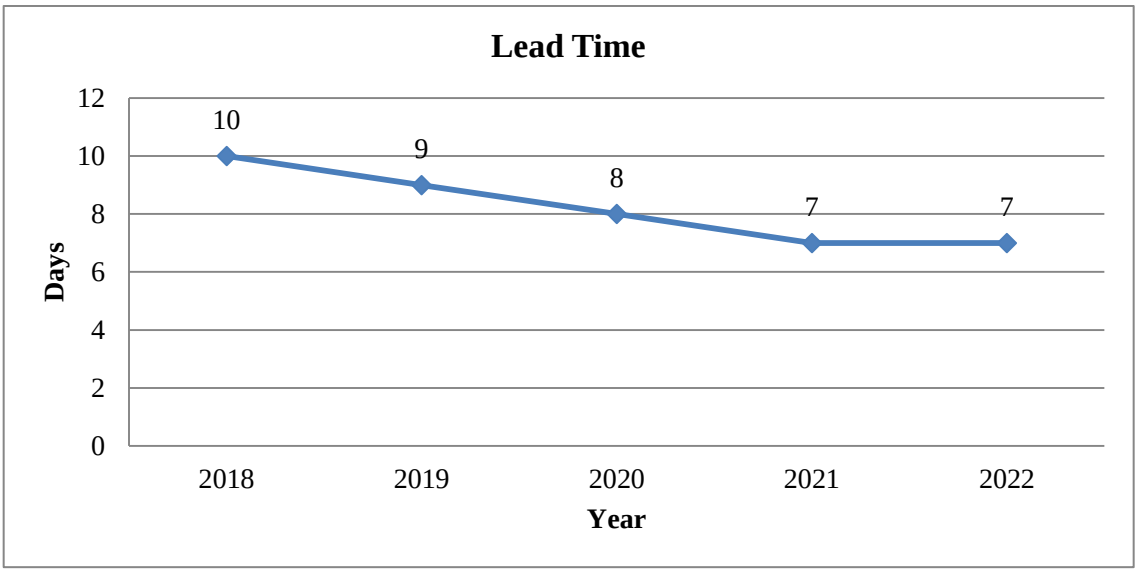

Figure 4.4: Trend Analysis on Lead Time

4.4.6.3 Operational Costs

The study also measured performance in terms of operational cost. The study collected data on the level of performance experienced by food and beverage manufacturing firms in the last five years in terms of operational cost from 2018 to 2022. Figure 4.5 presents a trend in operational cost. The findings regarding operational costs in the food and beverage manufacturing firms in Kenya indicate a gradual reduction in costs over the five-year period. The operational costs decreased from $1,200,000 in 2018 to $1,120,000 in 2022. This reduction suggests an improvement in cost efficiency and the ability of firms to manage and optimize their resources effectively. The findings suggest that the food and beverage manufacturing firms in Kenya have been successful in managing and reducing their operational costs over the years. By implementing cost-saving measures and

optimizing their operations, these firms have been able to achieve improved cost efficiency and financial performance.

The decrease in operational costs could be attributed to various factors such as process improvements, cost-saving initiatives, and better resource utilization. Implementing lean manufacturing practices, such as waste reduction and continuous improvement, can help identify and eliminate unnecessary costs in the supply chain (Momiwand & Shahin, 2012). Managing operational costs is crucial for the financial performance and sustainability of firms. As stated by Mogaka (2023), reducing operational costs can lead to increased profitability and competitiveness. By controlling and minimizing expenses, companies can improve their overall financial performance and allocate resources more strategically.

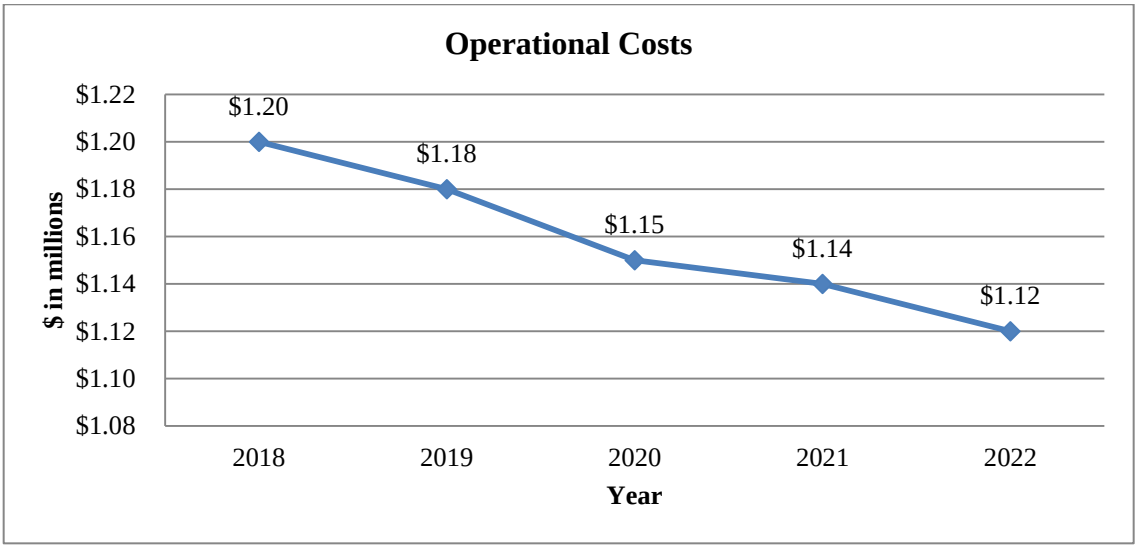

Figure 4.5: Trend Analysis in Operational Costs

4.6 Diagnostic Tests

Diagnostic tests were performed to test the assumptions of linear regression. The assumptions tested were normality, autocorrelation, multicollinearity, homoscedasticity and linear relationship. In case of violation of the regression assumptions, the confidence intervals as well as other scientific insights derived from the regression model may be

regarded as misleading, biased or inefficient and therefore the inferences derived incapable of being generalizable on other data

4.6.1 Linearity Test

When the value of sig. deviation from the linearity > 0.05, then in the multiple regression model it can be said that the predictor variables have significant effect on the response variable. If the value sig. deviation from linearity is < 0.05, then the relationship between the predictor with the response variable is said to be partially significant. In the SPSS output display (Table 4.10), the sig. value of supply chain agility = 0.665; supply chain integration = 0.555; value chain mapping = 0.563; supply chain automation = 0.674 and supplier capability = 0.559. In relation to these results, then the appropriate basis for decision making in our multiple linear regression model analysis can be concluded that there is significant linear relationship between supply chain agility, supply chain integration, value chain mapping, supply chain automation and supplier capability with performance of food and beverage manufacturing firms in Kenya. Thus, increasing the effect of the predictors improves the response variable.

Table 4. 10: Coefficients of Linearity Test

Model	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		Lower Bound	Upper Bound	Tolerance	VIF
Supply chain agility	.665	-13.627	11.412	.551	1.816
Supply chain integration	.555	-19.784	23.728	.192	5.200
Value chain mapping	.563	-21.061	18.506	.163	6.136
Supply chain automation	.674	-10.159	11.100	.600	1.665
Supplier capability	.559	-39.612	45.193	.268	3.734

4.6.2 Normality Test

Data in this study was continuous data and therefore testing of the normality (which was conducted in the statistical software “SPSS”) is a crucial step for deciding the measures of central tendency and statistical methods for data analysis. There are different methods

used to test the normality of data, including numerical and visual methods. Key requirements for both statistical and graphical methods for testing normality; is that the data are from a normal distribution and that there are no multiple outliers. The visual method otherwise known as graphical method includes Q-Q plots (Quantile - Quantile plots). From the figure 4.3 below it is evident that the data was from a normal distribution since the data points are close to the diagonal line.

Kolmogorov–Smirnov is an ideal numerical test method for this study. When $P > 0.05$, null hypothesis is accepted and data are said to be normally. Table 4.8 below gives test results of all the variables using Kolmogorov–Smirnov test of normality. All the variables (supply chain agility, supply chain integration, value chain mapping, supply chain automation, supplier capability and organization performance) had P- values more than 0.05. As such the study accepts the corresponding null hypothesis respectively and concludes that the data sets for the variables are normally distributed.

Table 4.11: Normality Test

Variables	**Kolmogorov-Smirnova**			**Shapiro-Wilk**		
	Statistics	**df**	**Sig.**	**Statistics**	**df**	**Sig.**
supply chain agility	.139	196	.058	.893	196	.060
supply chain integration	.128	196	.061	.949	196	.055
value chain mapping	.082	196	.067	.976	196	.052
supply chain automation	.120	196	.051	.956	196	.063
supplier capability	.125	196	.053	.873	196	.056
Organization performance	.105	196	.054	.942	196	.059

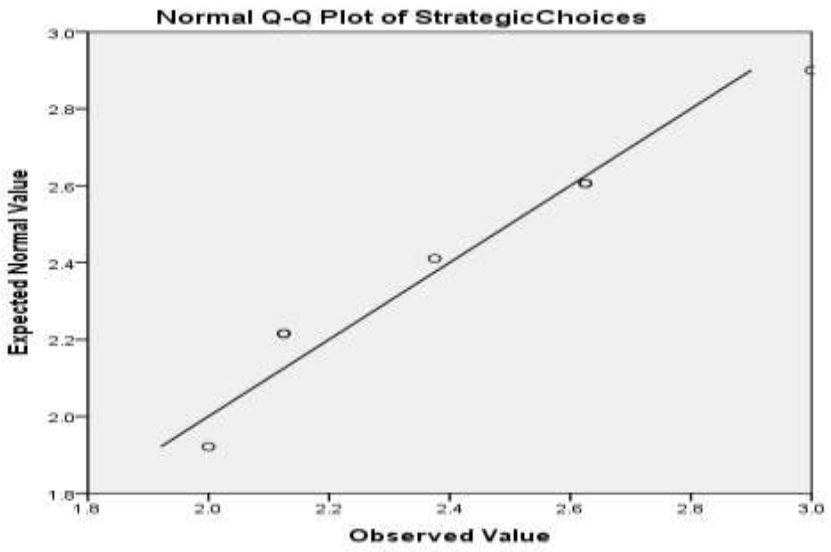

Figure 4.6: Normal Q-Q Plots

4.6.3 Multicollinearity Test

A Variance Inflation Factor (VIF) measures the extent to which multicollinearity has increased the variance of an estimated coefficient. Essentially VIF is a tool to measure and quantify how much the variance is inflated. In other words, it examines the extent to which a predictor variable can be explained by all the other predictor variables in the equation. When there is presence of correlation among predictor variables the standard error of coefficients of the predictors increases and as a result the variance of the predictor's coefficients is inflated. This can be corrected by re-specifying the model. The value of VIF =1 shows that the predictor variables are not correlated to each other. But when the value of VIF is $1< VIF < 5$, it shows that the variables are moderately correlated to each other. When the VIF is between 5 to 10 it shows that variables are highly correlated. In other words, a VIF $\geq$ 5 to 10, there will be multicollinearity among the predictors in the regression model. According to the results in table 4.12 of Regression Coefficients the value of VIF is $1< VIF < 5$. This implies that the variables are moderately correlated to each other.

The values corresponding to the variables in the Table 4.9 below are small (<5). Since all the VIF values were below 5, it was found that there was no multicollinearity among the independent variables. This implies that the results of the multiple regression equation are not misleading, since the independent variables in the multiple regression equation are not highly correlated amongst themselves.

Table 4.12: Multicollinearity Test Statistics

4.6.4 Heteroscedasticity Test

Variables	Tolerance	VIF
Supply chain agility	0.788	1.251
Supply chain integration	0.800	1.237
Value chain mapping	0.766	1.290
Supply chain automation	0.802	1.263

Violation of homoscedasticity tends to inhibit critical evaluation of forecast errors of standard deviation, which often leads to confidence intervals that are extremely narrow or extremely wide. Homoscedasticity in this study was assessed using the Breusch-Pagan test. The null hypothesis for this test was that the error variances were equal and were a multiple function of variables. Homoscedasticity normally occurs when the chi-square value is greater than the significance level (0.05). As indicated in Table 4.13, the chi-square value was 0.3186, which was greater than the significance level of 0.05. This implies that there was homoscedasticity in the regression model.

Table 4.13: Breusch-Pagan Test for Homoscedasticity

Ho: Constant variance	
Variables: Fitted with values of performance	
Chi2 (1)	0.96
Prob>chi2	0.3186

4.6.5 Autocorrelation Test

Autocorrelation occurs when the residuals of a regression model are correlated with one another, which can lead to inefficient estimates and bias in standard errors. In this study, autocorrelation was assessed using the Durbin-Watson statistic. The null hypothesis for this test was that there is no first-order autocorrelation among the residuals. A Durbin-Watson value close to 2 indicates no autocorrelation, values below 2 suggest positive autocorrelation, and values above 2 indicate negative autocorrelation. As shown in Table 4.14, the Durbin-Watson statistic for the regression model was 1.923, which is close to 2. This indicates that there was no autocorrelation in the residuals, confirming that the regression model assumptions were not violated.

Table 4.14: Autocorrelation Results

Model	Durbin-Watson Statistic	Interpretation
1	1.923	No autocorrelation

4.7 Correlation Analysis

The study computed Correlation analysis to determine the strength and the direction of the relationship between the variables being studied. If the correlation values are $r = \pm 0.1$ to ± 0.29 then the relationship between the two variables is small, if it is $r = \pm 0.3$ to ± 0.49 the relationship is medium, and when $r = \pm 0.5$ and above there is a strong relationship between the two variables under consideration. Table 4.15 presents the findings obtained.

The findings show that supply chain agility and performance of food and beverage manufacturing firms in Kenya have a strong positive and significant relationship ($r= 0.774$, $p<0.05$). The relationship was considered significant since the p-value (0.000) was less than the selected level of significance (0.05). This implies that supply chain agility has significant effect on performance of food and beverage manufacturing firms in Kenya. The findings agree with Rice *et al*. (2017), argue that supply chain agility has significant positive effects on organization performance.

Supply chain integration is also seen to have a positive significant relationship with performance of food and beverage manufacturing firms in Kenya ($r= .869$, $p<0.05$). Since the p-value (.023) was less than the selected level of significance (0.05), the relationship was considered significant. This therefore suggests that supply chain integration affects performance of food and beverage manufacturing firms in Kenya. The study findings agree with those of Muthoni and Mose (2020) that e-procurement and e-marketplaces, as well as making them available over the Web to foster cooperation and collaboration across the entire value chain. In today's dynamic business environment, many companies are expanding, merging, contracting, or otherwise redesigning their supply chain.

Value chain mapping is also seen to have a strong positive and significant relationship with performance of food and beverage manufacturing firms in Kenya ($r= .784$, $p<0.05$). Since the p-value (.001) was less than the selected level of significance (0.05), the relationship between the two variables was considered to be significant. The findings concur with those of MacCarthy (2022) that the value chain mapping process usually begins by grouping the company's main supplier groups with customer groups that represent the company's key business inputs and outputs. Looking at top suppliers and significant product lines is often a good place to start for companies in manufacturing.

Finally, supply chain automation is seen to have a positive and significant relationship with performance of food and beverage manufacturing firms in Kenya ($r= .727$, $p< 0.001$). The p-value (.021) was less than the selected level of significance (0.05) suggesting that the relationship between the two variables was significant. This means that supply chain automation affects performance of food and beverage manufacturing firms in Kenya. The findings agree with Mohsen (2023) that the supply chain automation influences organization performance. In addition, Chaudhari (2019) revealed that the Internet has lowered the barriers to effective collaboration, allowing companies to easily share demand-forecast information, production-capacity requirements, manufacturing schedules, and new product designs.

Table 4. 15: Correlation Analysis

		Performance	Supply Chain Agility	Supply Chain Integration	Value Chain Mapping	Supply Chain Automation Security
Performance	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	196				
Supply Chain Agility	Pearson Correlation	.774**	1			
	Sig. (2-tailed)	.000				.
	N	196	196			
Supply Chain Integration	Pearson Correlation	.869**	.261	1		
	Sig. (2-tailed)	.023	.147			
	N	196	196	196		
Value Chain Mapping	Pearson Correlation	.784**	.325	.264	1	
	Sig. (2-tailed)	.001	.168	.078		
	N	196	196	196	196	
Supply Chain Automation	Pearson Correlation	.727**	.317	.336	.266	1
	Sig. (2-tailed)	.021	.123	.574	.278	
	N	196	196	196	196	196

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

4.8 Multiple Regression Analysis

The study aimed to establish the influence of supply chain scalability on performance of food and beverage manufacturing firms in Kenya. To achieve the objective, the study conducted regression analysis to first establish whether there exist some relationship between supply chain agility, supply chain integration, value chain mapping, supply chain automation and performance of food and beverage manufacturing firms in Kenya. Using multiple regression analysis, the study examined the combined effect of independent variables on the dependent variable. The findings were presented in three tables discussed in sub-sections below.

4.8.1 Model Summary

Model summary was used to establish amount of variation in performance of food and beverage manufacturing firms in Kenya that can be explained by supply chain agility, supply chain integration, value chain mapping, supply chain automation. The predictive power of the model was determined using coefficient of determination (R^2). The model summary results in Table 4.16 show that the R-squared is 0.739 which suggests that 73.9% of all variation in performance of food and beverage manufacturing firms in Kenya are explained by supply chain agility, supply chain integration, value chain mapping, supply chain automation. The remaining 26.1% suggests that there are other factors that can be attributed to variation in performance of food and beverage manufacturing firms in Kenya that were not discussed in this study. Correlation coefficient (R) shows the relationship strength between the study variables. From the findings the variables were strongly and positively related as indicated r= 0.859.

Table 4.16: Model Summary

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

a. Predictors: (Constant), supply chain agility, supply chain integration, value chain mapping, supply chain automation

4.8.2 Analysis of Variance

To determine the fitness of the model to predict the dependent variable (performance of food and beverage manufacturing firms in Kenya), the study conducted an F-test at 95% confidence level. The significance of the study variables was determined based on the P-value of the variable coefficients at 0.05 significance level. The decision in the fitness of the model is accepted if p-values is below 0.05 and rejected if it is above 0.05. The findings in Table 4.17 showed that Prob>F 4, 48= 0.000 was less than the 0.05 significance level. This suggested that the model as constituted was fit in establishing the influence of supply chain scalability on performance of food and beverage manufacturing firms in Kenya. Further, the F-calculated, from the table (136.2) was greater than the F-critical, from f-

distribution tables (2.419) supporting the findings that supply chain agility, supply chain integration, value chain mapping, supply chain automation can be used to predict performance of food and beverage manufacturing firms in Kenya.

To test the significance of the study variables student t-test was used to establish the amount of influence each (supply chain agility, supply chain integration, value chain mapping, supply chain automation) had on performance of food and beverage manufacturing firms in Kenya.

Table 4.17: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.353	4	2.588	136.2	.000[b]
	Residual	3.663	191	0.019		
	Total	14.016	195			

a. Dependent Variable: Organization performance

b. Predictors: (Constant), supply chain agility, supply chain integration, value chain mapping, supply chain automation

4.8.3 Beta Coefficients of the Study Variables

From the coefficients in Table 4.18, the following regression model was fitted;

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

Where Y is performance of food and beverage manufacturing firms in Kenya*;* X_1 is supply chain agility; X_2 is supply chain integration; X_3 is value chain mapping; and X_4 is supply chain automation.

The findings showed that holding supply chain agility, supply chain integration, value chain mapping, supply chain automation to constant at zero, performance of food and beverage manufacturing firms in Kenya would be 1.481. The constant (β= 1.481) was significant at 0.05 significance level (P=0.000). The findings further showed that supply

chain agility had a coefficient of 0.159 indicating that holding all other factors constant, a unit increase in supply chain agility would result in a 15.9% increase in performance of food and beverage manufacturing firms in Kenya. The coefficient was significant since the p-value obtained (0.006) was less than the level of significance of 0.05. It was therefore established that supply chain agility has a positive significant effect on performance of food and beverage manufacturing firms in Kenya.

Regarding supply chain integration, it was observed that supply chain integration had a coefficient of 0.232 suggesting that holding all other factors constant, a unit change in supply chain integration results in a 23.2% change in performance of food and beverage manufacturing firms in Kenya. This variable was significant since the p-value (0.003) was less than the significance 0.05. Results further showed that value chain mapping has a coefficient of 0.216 indicating that increasing value chain mapping by one unit while holding all other factors constant would result in 0.216-unit increase in performance of food and beverage manufacturing firms in Kenya. This relationship was significant since the p-value (0.004) was less than the 0.05 significance level.

Regarding supply chain automation, it was noted that supply chain automation had a coefficient of 0.196 indicating that holding all other factors constant, a unit increase in supply chain automation leads to a 19.6% improvement in performance of food and beverage manufacturing firms in Kenya. The variable was also found to be significant since the p-value (0.005) was less than the selected level of significance (0.05).

Based on the magnitude, all the variables had positive effects with supply chain integration having the highest positive effect followed by value chain mapping, supply chain automation and lastly was supply chain agility. The study finding agree with the findings of Zhang, Comite and Matac (2022) that supply chain scalability influence supply chain performance.

Table 4.18: Beta Coefficients of Study Variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.481	0.201		7.368	.000
	supply chain agility	0.159	0.068	0.067	2.338	.006
	supply chain integration	0.232	0.079	0.251	2.937	.003
	value chain mapping	0.216	0.082	0.016	2.634	.004
	supply chain automation	0.196	0.069	0.126	2.841	.005

a. Dependent Variable: Organization Performance

4.9 Test of Hypotheses

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

H_1: There is no significant effect of supply chain agility on performance of food and beverage manufacturing firms in Kenya

H_2: There is no significant effect of supply chain integration on performance of food and beverage manufacturing firms in Kenya.

H_3: There is no significant effect of value chain mapping on performance of food and beverage manufacturing firms in Kenya.

H_4: There is no significant effect of supply chain automation on performance of food and beverage manufacturing firms in Kenya.

H_5: There is no significant moderating effect of supplier capability on relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya

4.9.1 Test for Hypothesis One

The first specific objective of the study was to determine the effect of supply chain agility on the performance of food and beverage manufacturing firms in Kenya. The associated null hypothesis stated that supply chain agility has no significant influence on firm performance. To test this, a univariate regression analysis was conducted, with firm performance regressed on supply chain agility.

The coefficient of determination (R-squared) indicates the proportion of variation in the dependent variable that can be explained by the independent variable, ranging from 0 to 1, with higher values representing a stronger effect. As shown in Table 4.19, the R-squared for the relationship between supply chain agility and firm performance was 0.241. This implies that, at a 95% confidence level, 24.1% of the variation in performance can be attributed to changes in supply chain agility, while the remaining 75.9% is influenced by other factors. Therefore, supply chain agility explains a meaningful portion of performance variation, though additional variables also contribute significantly.

Table 4.19: Model Summary for Supply Chain Agility

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

a. Predictors: (Constant), Supply Chain Agility

The analysis of variance was used to determine whether the regression model is a good fit for the data. It also gave the F-test statistic; the linear regression's F-test has the null hypothesis that there is no linear relationship between the two variables. From the analysis of variance (ANOVA) findings in Table 4.20, the study found out that that Prob>$F_{1,51}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model

as constituted was fit to predict performance of food and beverage manufacturing firms in Kenya. Further, the F-calculated (1036) was greater than the F-critical, from f-distribution tables (3.890) supporting the findings that supply chain agility can be used to predict performance of food and beverage manufacturing firms in Kenya.

Table 4.20: ANOVA for Supply Chain Agility

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.87	1	24.87	1036	.000[b]
	Residual	4.735	194	0.024		
	Total	30.605	195			

a. Dependent Variable: Organization performance

b. Predictors: (Constant), Supply Chain Agility

From the results in Table 4.17, the following regression model was fitted.

$$Y = 2.069 + 0.433\ X_1$$

(X_1 is supply chain agility)

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

These findings agree with prior studies by Manik (2022) and Siagian and Johono (2022), which highlighted that agile supply chains enhance operational responsiveness, reduce lead times, and improve overall organizational performance. The findings also concur

with Gunawan et al. (2024), who emphasized that firms capable of quickly adapting to market changes and customer demands achieve superior performance outcomes. Thus, the evidence supports the conclusion that investing in supply chain agility is crucial for sustaining competitiveness and operational efficiency in dynamic manufacturing environments.

Table 4.21: Beta Coefficients for Supply Chain Agility

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.069	.174		11.881	.000
	Supply Chain Agility	.433	.045	.491	9.723	.000

a. Dependent Variable: Organization Performance

4.9.2 Test for Hypothesis Two

The second objective of the study was to determine the influence of supply chain integration on performance of food and beverage manufacturing firms in Kenya. The corresponding hypothesis was:

H_{02}: Supply chain integration has no significant influence on performance of food and beverage manufacturing firms in Kenya.

A univariate analysis was therefore conducted to test the null hypothesis. From the model summary findings in Table 4.22, the r-squared for the relationship between supply chain integration and performance of food and beverage manufacturing firms in Kenya was 0.269; this is an indication that at 95% confidence interval, 26.9% variation in performance of food and beverage manufacturing firms in Kenya can be attributed to changes in supply chain integration. Therefore, facility management security can be used to explain 26.9% change in performance of food and beverage manufacturing firms in Kenya. However, the remaining 73.1% variation in performance of food and beverage

manufacturing firms in Kenya suggests that there are other factors other than supply chain integration that explain performance of food and beverage manufacturing firms in Kenya.

Table 4.22: Model Summary for Supply Chain Integration

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

a. Predictors: (Constant), Supply Chain Integration

The analysis of variance was used to determine whether the regression model is a good fit for the data. From the analysis of variance (ANOVA) findings in Table 4.19, the study found out that that Prob>$F_{1,51}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model as constituted was fit to predict performance of food and beverage manufacturing firms in Kenya. Further, the F-calculated, from the table (415.9) was greater than the F-critical, from f-distribution tables (3.889) supporting the findings that supply chain integration can be used to predict performance of food and beverage manufacturing firms in Kenya.

Table 4.23: ANOVA for Supply Chain Integration

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	51.159	1	51.159	415.9	.000[b]
	Residual	23.817	194	0.123		
	Total	74.976	195			

a. Dependent Variable: Organization performance

b. Predictors: (Constant), supply chain integration

From the results in table 4.24, the following regression model was fitted.

$$Y = 1.792 + 0.497 X_2$$

(X_2 is Supply Chain Integration)

The coefficient results showed that the constant had a coefficient of 1.792 suggesting that if supply chain integration was held constant at zero, performance of food and beverage manufacturing firms in Kenya would be at 1.792 units. In addition, results showed that supply chain integration coefficient was 0.497 indicating that a unit increase in supply chain integration would result in a 0.497 increase in performance of food and beverage manufacturing firms in Kenya. It was also noted that the P-value for supply chain integration coefficient was 0.000 which is less than the set 0.05 significance level indicating that supply chain integration was significant. Based on these results, the study rejected the null hypothesis and accepted the alternative that supply chain integration has negative significant influence performance of food and beverage manufacturing firms in Kenya.

These findings agree with Oliveira and Gonzalez (2022) and Wang et al. (2022), who reported that integrating internal processes and collaborating closely with supply chain partners enhances efficiency, reduces costs, and improves overall performance. The results also concur with Cahyaningratri and Naylah (2023), who emphasized that well-integrated supply chains improve coordination, responsiveness, and operational effectiveness. Therefore, the study rejects the null hypothesis and concludes that supply chain integration positively and significantly influences firm performance in the Kenyan food and beverage manufacturing sector.

Table 4.24: Beta Coefficients for Supply Chain Integration

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.792	.188		9.523	.000
	Supply chain integration	.479	.046	.519	10.462	.000

a. Dependent Variable: Organization performance

4.9.3 Test for Hypothesis Three

The third objective of the study was to establish the influence of value chain mapping on performance of food and beverage manufacturing firms in Kenya. The corresponding hypothesis was:

H_{03} Value chain mapping has no significant influence on performance of food and beverage manufacturing firms in Kenya.

A univariate analysis was therefore conducted to test the null hypothesis. From the model summary findings in Table 4.25, the r-squared for the relationship between value chain mapping and performance of food and beverage manufacturing firms in Kenya was 0.215; this is an indication that at 95% confidence interval, 21.5% variation in performance of food and beverage manufacturing firms in Kenya can be attributed to changes in value chain mapping. Therefore, value chain mapping can be used to explain 21.5% change in performance of food and beverage manufacturing firms in Kenya. However, the remaining 78.5% variation in performance of food and beverage manufacturing firms in Kenya suggests that there are other factors other than value chain mapping that explain performance of food and beverage manufacturing firms in Kenya

Table 4.25: Model Summary for the Value Chain Mapping

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

a. Predictors: (Constant), Value Chain Mapping

The analysis of variance was used to determine whether the regression model is a good fit for the data. From the analysis of variance (ANOVA) findings in Table 4.26, the study found out that that Prob>$F_{1,51}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model as constituted was fit to predict performance of food and beverage manufacturing firms in Kenya. Further, the F-calculated, from the table (305.47) was greater than the F-critical, from f-distribution tables (3.890) supporting the findings

that value chain mapping can be used to predict to predict performance of food and beverage manufacturing firms in Kenya.

Table 4.26: ANOVA for Value Chain Mapping

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	40.933	1	40.933	305.47	.000[b]
	Residual	25.602	191	0.134		
	Total	66.535	195			

a. Dependent Variable: Organization performance

b. Predictors: (Constant), Value Chain Mapping

From the results in Table 4.27, the following regression model was fitted.

$$Y = 1.808 + 0.469\ X_3$$

(X_3 is Value Chain Mapping)

The coefficient results showed that the constant had a coefficient of 1.808 suggesting that if value chain mapping was held constant at zero, performance of food and beverage manufacturing firms in Kenya would be at 1.808 units. In addition, results showed that value chain mapping coefficient was 0.469 indicating that a unit increase in value chain mapping would result in a 0.469-unit improvement in performance of food and beverage manufacturing firms in Kenya. It was also noted that the P-value for value chain mapping was 0.000 which is less than the set 0.05 significance level indicating that value chain mapping was significant. Based on these results, the study rejected the null hypothesis and accepted the alternative that value chain mapping has positive significant influence on performance of food and beverage manufacturing firms in Kenya.

These findings agree with Priyanka and Kandpal (2022), who highlighted that value chain mapping enables firms to identify inefficiencies, optimize resource allocation, and improve operational processes. The results also concur with Faisal and Banwet (2019), who emphasized that mapping the value chain supports better coordination across

stakeholders, enhances process transparency, and strengthens competitiveness. Consequently, the study rejects the null hypothesis and concludes that value chain mapping positively and significantly influences the performance of food and beverage manufacturing firms in Kenya.

Table 4.27: Beta Coefficients for Value Chain Mapping

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.808	.215		8.398	.000
	value chain mapping	.469	.052	.464	9.032	.000

a. Dependent Variable: Organization performance

4.9.4 Test for Hypothesis Four

The fourth objective of the study was to evaluate the influence of supply chain automation on performance of food and beverage manufacturing firms in Kenya. The corresponding hypothesis was:

H_{04}: Supply chain automation has no significant influence on performance of food and beverage manufacturing firms in Kenya.

A univariate analysis was therefore conducted to test the null hypothesis. From the model summary findings in Table 4.28, the r-squared for the relationship between supply chain automation and performance of food and beverage manufacturing firms in Kenya was 0.222; this is an indication that at 95% confidence interval, 22.2% variation in performance of food and beverage manufacturing firms in Kenya can be attributed to supply chain automation. Therefore, supply chain automation can be used to explain 22.2% change in performance of food and beverage manufacturing firms in Kenya. However, the remaining 77.8% variation in performance of food and beverage manufacturing firms in Kenya suggests that there are other factors other than supply chain automation that explain performance of food and beverage manufacturing firms in Kenya

Table 4.28: Model Summary for Supply Chain Automation

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

a. Predictors: (Constant), Supply Chain Automation

The analysis of variance was used to determine whether the regression model is a good fit for the data. From the analysis of variance (ANOVA) findings in Table 4.29, the study found out that that Prob>$F_{1,51}$= 0.000 was less than the selected 0.05 level of significance. This suggests that the model as constituted was fit to predict performance of food and beverage manufacturing firms in Kenya. Further, the F-calculated, from the table (321.98) was greater than the F-critical, from f-distribution tables (3.890) supporting the findings that supply chain automation can be used to predict to predict performance of food and beverage manufacturing firms in Kenya.

Table 4.29: ANOVA for Past Strategy on Supply Chain Automation

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	42.179	1	42.179	321.98	.000[b]
	Residual	25.398	194	.131		
	Total	67.577	195			

a. Dependent Variable: Organization performance

b. Predictors: (Constant), supply chain automation

From the results in table 4.30, the following regression model was fitted.

$$Y = 2.142 + 0.411\ X_4$$

(X_4 is Supply Chain Automation)

The coefficient results showed that the constant had a coefficient of 2.142 suggesting that if supply chain automation was held constant at zero, performance of food and beverage manufacturing firms in Kenya would be at 2.142 units. In addition, results showed that

supply chain automation coefficient was 0.411 indicating that a unit increase in supply chain automation would result in a 0.411 unit improvement in performance of food and beverage manufacturing firms in Kenya. It was also noted that the P-value for past strategy was 0.000 which is less than the set 0.05 significance level indicating that supply chain automation was significant. Based on these results, the study rejected the null hypothesis and accepted the alternative that supply chain automation has positive significant influence on performance of food and beverage manufacturing firms in Kenya.

These findings agree with Mohsen (2023), who emphasized that automating supply chain processes enhances efficiency, reduces errors, and improves operational responsiveness. The results also concur with Chaudhari (2019), who reported that automation facilitates real-time monitoring, better forecasting, and improved customer service, ultimately boosting organizational performance. Consequently, the study rejects the null hypothesis and concludes that supply chain automation positively and significantly influences the performance of food and beverage manufacturing firms in Kenya.

Table 4.30: Beta Coefficients for Supply Chain Automation

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.142	.176		12.185	.000
	supply chain automation	.411	.045	.471	9.207	.000

a. Dependent Variable: Organization performance

4.9.5 Test for Hypothesis Five

The fifth objective of the study was to determine the moderating effect of supplier capability on the relationship between supply chain scalability (supply chain agility, supply chain integration, value chain mapping and supply chain automation and performance of food and beverage manufacturing firms in Kenya. Moderation happens when the relationship between the dependent variable and the independent variables is

dependent on a third variable (moderating variable). The effect that this variable has is termed as interaction as it affects the direction or strength of the relationship between the dependent and independent variable. To achieve the fifth research objective, the study computed moderating effect regression analysis. This (moderating effect regression analysis) also guided the study in testing the fifth research hypothesis. Supplier capability (M) was introduced as the moderating variable.

H_{05}: Supplier capability has no significant moderating effect on the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya.

The model for the moderating effect was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X + \beta_3 X_1 Z + \varepsilon$$

Where Z is the moderator (Supplier capability), X1 is the independent variable and Y is the dependent variable

The study combined all the four variables (supply chain agility, supply chain integration, value chain mapping and supply chain automation) to form a new variable X. The study then used stepwise regression to establish the moderating effect of Supplier capability (M) on the relationship between independent variable (X) and performance of food and beverage manufacturing firms in Kenya (Y).

From the model summary findings in Table 4.31, the first model for which is the regression between performance of food and beverage manufacturing firms in Kenya (X) without moderator, supplier capability (M) and interaction, the value of R-squared was 0.336 which suggests that 33.6% change in performance of food and beverage manufacturing firms in Kenya can be explained by changes in supply chain scalability. The p-value for the first model (0.000) was less than the selected level of significance (0.05) suggesting that the model was significant. The findings in the second model which constituted components of supply chain scalability, supplier capability and performance

of food and beverage manufacturing firms in Kenya (X*M) as predictors, the r-squared was 0.568. This implies that the introduction of supplier capability in the second model led to a 0.232 increase in r-squared, showing that supplier capability positively moderates performance of food and beverage manufacturing firms in Kenya.

Table 4.31: Model Summary for Moderation Effect

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

a. Predictors: (Constant), supply chain scalability

b. Predictors: (Constant), supply chain scalability, supplier capability, Interaction (X*M)

From the model summary findings in Table 4.32, the F-calculated for the first model, was 569.93 and for the second model was 506.85. Since the F-calculated for the two models were more than the F-critical, 3.890 (first model) and 2.651 (second model), the two models were good fit for the data and hence they could be used in predicting the moderating effect of supplier capability on performance of food and beverage manufacturing firms in Kenya.

Table 4.32: ANOVA for Moderation Effect

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	63.832	1	63.832	569.93	.000[b]
	Residual	21.675	194	0.112		
	Total	85.507	195			
2	Regression	107.958	3	35.986	506.85	.000[c]
	Residual	13.622	192	0.071		
	Total	121.58	195			

a. Dependent Variable: Organization performance
b. Predictors: (Constant), supplier capability, supply chain agility * supplier capability, supply chain integration * supplier capability, information management security * supplier capability, value chain mapping * supplier capability, supply chain automation* supplier capability

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

$Y = 1.387 + 0.608 X$

Where X is supply chain scalability

The findings show that when supply chain scalability is held to a constant zero, performance of food and beverage manufacturing firms in Kenya will be at a constant value of 1.387. The findings also show that supply chain scalability has a statistically significant effect on performance of food and beverage manufacturing firms in Kenya as shown by a regression coefficient of 0.608 (p-value= .000).

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

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

Where X is supply chain scalability; M is supplier capability and X*M is the interaction term between supply chain scalability and supplier capability.

The findings show that when supply chain scalability, supplier capability, interaction (X*M) are held to a constant zero, performance of food and beverage manufacturing firms in Kenya will be at a constant value of 3.876. The model also indicated that supply chain scalability had a positive and statistically significant effect on performance of food and beverage manufacturing firms in Kenya as shown by a regression coefficient of 0.220 (p-value= 0.002). It is also seen that supply chain capability had a positive and significant effect on performance of food and beverage manufacturing firms in Kenya as shown by a regression coefficient 0.325. On the other hand, interaction of supply chain scalability and supplier capability (X*M) also had a positive and significant effect on performance of food and beverage manufacturing firms in Kenya as shown by a regression coefficient of 0.283 (p-value= 0.000).

It is therefore seen that supply chain scalability on its own has 22% effect on performance of food and beverage manufacturing firms in Kenya. However, when interacted with supplier capability, it has an effect of 28.3%. This is a clear indication that introduction of supplier capability as moderating variable has positive influence on performance of food and beverage manufacturing firms in Kenya. The study therefore rejects the null hypothesis and accepts the alternative that supplier capability has significant moderating effect on the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya.

These findings agree with Prastia and Nursyamsia (2020), who emphasized that effective supplier capabilities, including reliability, innovation, and quality assurance, enhance the performance benefits of supply chain practices. Similarly, Kareem (2020) noted that supplier competence enables firms to respond rapidly to market changes, optimize resource allocation, and achieve sustained competitive advantage. The study also concurs with Scheer, Miao and Garrett (2020), who argued that integrating supplier capabilities with scalable supply chain strategies allows firms to maximize efficiency, reduce delays, and improve service delivery. Therefore, the study rejects the null hypothesis and concludes that supplier capability has a significant moderating effect on the relationship

between supply chain scalability and performance of food and beverage manufacturing firms in Kenya.

Table 4.33: Beta Coefficients for Moderation Effect

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

a. Dependent Variable: Organization performance

4.9.6 Summary of Hypothesis Testing

The hypotheses for this study were tested as summarized in Table 4.30 below. On the first hypothesis that supply chain agility had no significant influence on performance of food and beverage manufacturing firms in Kenya, it was established that the P-value was 0.000<0.05, thus the hypothesis was rejected. The second hypothesis that supply chain integration has no significant influence on performance of food and beverage manufacturing firms in Kenya, the P-value of 0.000<0.05 implied that supply chain integration had a significant relationship with performance of food and beverage manufacturing firms in Kenya, hence the hypothesis was rejected. This was also the case for the third and fourth hypotheses, where the results revealed that the P-values were less than the standard P-value of 0.05, hence the hypotheses rejected.

Table 4.34: Summary of Hypothesis Testing

Hypothesis	R^2	Beta	P-Value	Decision
H_{01}: There is no significant effect of supply chain agility on performance of food and beverage manufacturing firms in Kenya	0.241	0.433	0.000	Reject the Null Hypothesis
H_{02}: There is no significant effect of supply chain integration on performance of food and beverage manufacturing firms in Kenya	0.269	0.479	0.000	Reject the Null Hypothesis
H_{03}: There is no significant effect of value chain mapping on performance of food and beverage manufacturing firms in Kenya	0.215	0.469	0.000	Reject the Null Hypothesis
H_{04}: There is no significant effect of supply chain automation on performance of food and beverage manufacturing firms in Kenya	0.222	0.411	0.000	Reject the Null Hypothesis
H_{05}: There is no significant moderating effect of supplier capability on relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya**.**	0.568		0.000	Reject the Null Hypothesis

4.9.7 Optimal Model

An "*optimal model*" generally refers to a model that best meets a defined objective within given constraints, balancing accuracy, efficiency, and simplicity for effective decision-making or predictions. The process of determining an optimal model can vary depending on the type of model, the data, and the specific goals of its application. In the optimal mode, in Figure 4.7, the independent variables were revised according to their significance. From the multivariate regression model, supply chain integration was the most significant independent variable followed by value chain mapping, supply chain automation and supply chain agility. The moderating variable, supplier capability was also found to have significant moderating effect on the relationship between supply chain scalability and performance of food and beverage manufacturing firms.

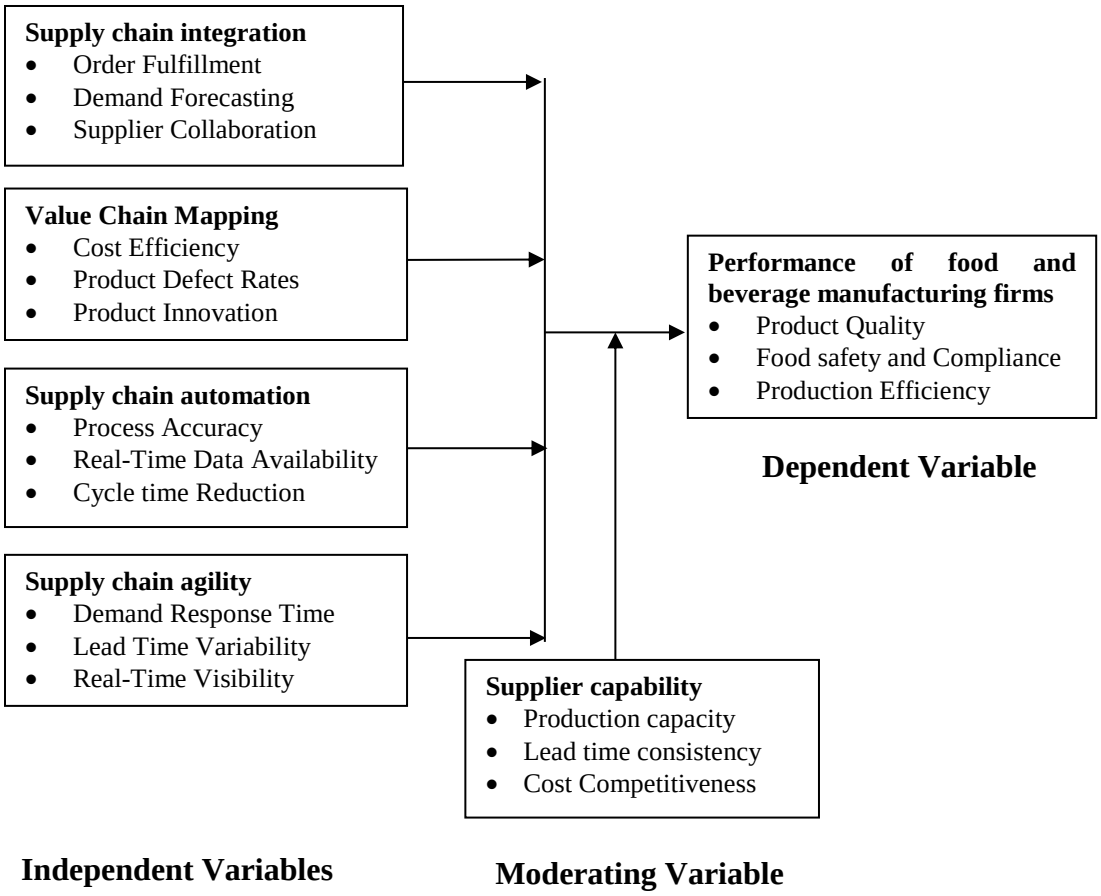

Figure 4.7: Optimal Model

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter begins with a comprehensive summary of the key findings derived from the study findings as per the objectives of the study. This is followed by conclusions, which are also developed as per the objectives of the study. It also offers actionable recommendations for future research and practical applications, ensuring that the study's contributions extend beyond its immediate scope and resonate within the wider academic and practical communities.

5.2 Summary of the Findings

This study was on supply chain scalability and performance of food and beverage manufacturing firms in Kenya. It sought to determine the effect of supply chain agility, supply chain integration, value chain mapping and supply chain automation on performance of food and beverage manufacturing firms in Kenya. It also sought to determine the moderating effect of supplier capability on the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya.

5.2.1 Supply Chain Agility

The study, through descriptive analysis, identified a high degree of process interconnectivity within supply chain networks, emphasizing the importance of effectively integrating supply chains and cultivating long-term relationships with customers and suppliers for enhanced performance. Furthermore, it underscored the necessity for flexibility and responsiveness to evolving market demands, particularly through innovative product offerings, to stay competitive. Additionally, the study highlighted various factors contributing to supply chain agility, such as delivering value

to customers, readiness for change, valuing human expertise, and forming virtual partnerships, all of which were linked to improved performance outcomes.

Moreover, rapid responsiveness to changing customer demands and market dynamics emerged as a critical aspect of organizational success in dynamic environments. The ability to swiftly adapt to demand fluctuations, both in volume and variety, not only ensures efficient customer service but also maintains a competitive advantage. Furthermore, producing a diverse range of products characterized by low-cost, high-quality, and short lead times was identified as key to enhancing performance, as it aligns with customer preferences and boosts satisfaction while improving operational efficiency and minimizing inventory costs.

Moreover, the study emphasized the importance of closely monitoring end-user trends to foster supply chain agility and enhance performance. Organizations that proactively adapt their strategies, product offerings, and supply chain operations to align with market trends are better positioned to meet customer needs effectively and maintain competitiveness. Supply chain agility was also recognized for its role in minimizing lead times, facilitating faster product delivery, improving customer service, and gaining a competitive edge. Ultimately, the study concluded that supply chain agility enables organizations to optimize resource utilization, reduce costs, and maintain high-quality standards by adjusting production and distribution processes in response to demand fluctuations, thus contributing to overall performance improvement.

From correlation analysis, the study found that there is a strong positive and significant relationship supply chain agility and performance of food and beverage manufacturing firms in Kenya. This implies that supply chain agility has significant effect on performance of food and beverage manufacturing firms in Kenya. Regression analysis showed that supply chain agility has positive significant influence on performance of food and beverage manufacturing firms in Kenya. This implies that an improvement in supply chain agility, in terms of distribution flexibility, product innovations and reacting to

change, leads to an improvement in performance of food and beverage manufacturing firms in Kenya.

5.2.2 Supply Chain Integration

Descriptive analysis demonstrates that integration facilitates the seamless sharing of real-time information among firms, fostering better coordination and swift responses to market dynamics. This collaborative environment not only bolsters operational efficiency but also streamlines activities across the supply chain, minimizing waste and optimizing inventory management. Through close collaboration with suppliers and distributors, organizations can eliminate redundancies and negotiate favorable terms, ultimately enhancing financial performance and ensuring uninterrupted supply amid market uncertainties. By integrating their supply chains, firms can quickly respond to changing market conditions, such as fluctuations in demand or the introduction of new products.

Internally, the study showed the pivotal role of IT infrastructure in enhancing operational efficiency by connecting various departments within organizations. Furthermore, external integration, where companies within the same supply chain collaborate to meet customer demands, emerges as a key driver of supply chain performance improvement. This external integration leads to reduced lead times, heightened customer satisfaction, and increased competitiveness. Moreover, the study emphasizes the significance of joint knowledge creation among supply chain partners in understanding and responding effectively to market dynamics, fostering innovation, and gaining a competitive edge.

Resource sharing emerges as a critical aspect of supply chain integration, yielding benefits such as enhanced flexibility, cost reduction, and improved competitiveness. The study identifies the potential of supply chain integration to enable rapid responses to market changes and facilitate market expansion, thereby positioning organizations for sustained success. Additionally, collaboration between suppliers and transport companies is recognized as a means to enhance service quality, cost efficiency, and customer

satisfaction, further highlighting the transformative impact of supply chain integration on organizational performance and competitiveness.

From correlation analysis, the study established that supply chain integration is also seen to have a positive significant relationship with performance of food and beverage manufacturing firms in Kenya. This therefore suggests that supply chain integration affects performance of food and beverage manufacturing firms in Kenya. Regression analysis showed that supply chain integration has positive significant influence on performance of food and beverage manufacturing firms in Kenya. This implies that an improvement in supply chain integration, conceptualized in terms of information technology integration, internal resources integrations and supply chain collaboration, leads to an improvement in the performance of food and beverage manufacturing firms in Kenya.

5.2.3 Value Chain Mapping

Through descriptive analysis, it becomes evident that value chain mapping aids in identifying inefficiencies and areas ripe for improvement within manufacturing processes. This holistic view enables firms to streamline operations, eliminate wasteful practices, and preemptively identify potential bottlenecks and vulnerabilities in the supply chain. By understanding the interconnectedness of various stages and stakeholders, manufacturing firms can develop contingency plans to mitigate risks effectively. Ultimately, value chain mapping serves as a pivotal tool in optimizing operations, fostering collaboration, and supporting strategic decision-making, thereby enhancing competitiveness and customer satisfaction.

Moreover, the study shows the effectiveness of value chain mapping in visualizing the flow of products throughout the value chain. By depicting the sequence of activities involved in the production process, firms can gain insights into areas where enhancements are needed. Additionally, value chain mapping facilitates the depiction of governance structures and relationships within the value chain, particularly concerning different

market channels. This comprehensive understanding aids in identifying gaps or bottlenecks in production flow, thus enabling firms to address inefficiencies, delays, or constraints hindering smooth operations.

Furthermore, the study delves into scheduling approaches within value chain management, highlighting the importance of both backward and forward scheduling techniques. Backward scheduling allows firms to determine deadlines related to material availability and transportation by working backward from the desired delivery date. On the other hand, forward scheduling enables adjustments to schedules based on current status, ensuring timely delivery. However, the study acknowledges that while value chain mapping is invaluable in optimizing operations and scheduling, it may have limitations in capturing the complexity of the broader business environment and its impact on value chains.

From correlation analysis, the study found value chain mapping has a strong positive and significant relationship with performance of food and beverage manufacturing firms in Kenya. This implies that value chain mapping has significant effect on performance of food and beverage manufacturing firms in Kenya. Regression analysis showed that value chain mapping has positive significant influence on performance of food and beverage manufacturing firms in Kenya. This implies that an improvement in value chain mapping, measured in terms data overlays, documenting information and network research and participatory, leads to an increase in performance of food and beverage manufacturing firms in Kenya.

5.2.4 Supply Chain Automation

From descriptive analysis, the study findings showed that supply chain automation has a significant enhancement in operational efficiency due to streamlined processes and reduced manual errors. Automation enables handling a larger volume of orders without compromising quality, leading to increased productivity. Moreover, automated systems improve inventory management, ensuring optimal stock levels and minimizing stockouts,

thus effectively meeting customer demands. Cost reduction and savings emerge as another crucial impact, further underlining the importance of supply chain automation.

Furthermore, supply chain automation greatly improves customer service experience by providing faster order fulfillment and accurate delivery tracking. Real-time visibility and monitoring of the supply chain allow proactive identification and addressing of potential risks, offering firms a competitive advantage. The study also highlights the incorporation of best practices software in ERP systems, indicating a reflection of effective business processes interpretation by vendors. Additionally, automation enables firms to offer an online shopping experience and utilize electronic data interchange (EDI) for supply chain management processes, positively impacting customer experience and communication.

Moreover, the study emphasizes the value of automated systems in providing real-time updates and personalized services to customers, enhancing order visibility and satisfaction. It recognizes the benefits of integrating ERP systems, including enhanced operational efficiency and resource management, along with utilizing sales forecasting for optimizing resource allocation and production planning. Automated online ordering systems serve as effective communication channels, providing updates throughout the order management process. Overall, the study underscores the multifaceted benefits of automation in improving operational efficiency, customer satisfaction, and communication in supply chain management.

From correlation analysis, the study established that supply chain automation has a positive and significant relationship with performance of food and beverage manufacturing firms in Kenya. This means that supply chain automation affects performance of food and beverage manufacturing firms in Kenya. Regression analysis showed that supply chain automation has positive significant influence on performance of food and beverage manufacturing firms in Kenya. This implies that an improvement in supply chain automation in terms of warehouse automation, document automation and tender automation, leads to a subsequent increase in performance of food and beverage manufacturing firms in Kenya.

5.2.5 Supplier Capability

From descriptive statistics, the study found that high-quality products delivered on time, coupled with innovative ideas and resilient backup plans from suppliers, enable firms to meet evolving customer demands and maintain supply chain continuity, even during challenging times. Cost-effective solutions provided by suppliers also grant competitive advantages, allowing for competitive pricing strategies. Additionally, the study highlights the significance of digital connectivity and seamless integration of IT systems with supply chain partners, contributing to standardized operations, efficiency, and effective time-based logistics solutions like continuous replenishment and Just-in-Time.

Moreover, the study emphasizes the value of standardized rules, procedures, and policies alongside compatibility of IT systems among supply chain partners. Superior IT infrastructure is recognized as instrumental in gaining competitive advantages and facilitating efficient information flow within the supply chain. Active programs capturing individuals' expertise and knowledge transfer further enhance operational effectiveness. The extensive utilization of supplier capabilities among firms in the food and beverage manufacturing industry in Kenya is acknowledged for fostering effective collaboration, coordination, and integration with supply chain partners. This utilization facilitates seamless information sharing, efficient logistics management, and enhanced responsiveness to customer demands, underscoring the integral role of supplier capabilities in optimizing supply chain operations.

The moderating effect analysis showed that supplier capability has a moderating effect on the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya. Therefore, the introduction of supplier capability as moderating variable has positive influence on performance of food and beverage manufacturing firms in Kenya. This implies that an improvement in supplier capability leads to an improvement in the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya.

5.3 Conclusions

5.3.1 Supply Chain Agility

The study concludes that supply chain agility has a positive and significant effect on the performance of food and beverage manufacturing firms in Kenya. The findings indicated that distribution flexibility, product innovations and reacting to change affect performance of food and beverage manufacturing firms in Kenya. This means that an improvement in supply chain agility, in terms of distribution flexibility, product innovations and reacting to change, would lead to an improvement in performance of food and beverage manufacturing firms in Kenya.

5.3.2 Supply Chain Integration

The study also concludes that supply chain integration has a positive and significant effect on the performance of food and beverage manufacturing firms in Kenya. The study findings indicated that information technology integration, internal resources integrations and supply chain collaboration have an effect on the performance of food and beverage manufacturing firms in Kenya. This implies that an improvement in supply chain integration, conceptualized in terms of information technology integration, internal resources integrations and supply chain collaboration, would lead to an improvement in the performance of food and beverage manufacturing firms in Kenya.

5.3.3 Value Chain Mapping

The study further concludes that value chain mapping has a strong positive and significant relationship with performance of food and beverage manufacturing firms in Kenya. The study findings indicated that data overlays, documenting information and network research and participatory have an effect on the performance of food and beverage manufacturing firms in Kenya. This shows that an improvement in value chain mapping, measured in terms data overlays, documenting information and network research and

participatory, would lead to an increase in performance of food and beverage manufacturing firms in Kenya.

5.3.4 Supply Chain Automation

The study concludes that supply chain automation has a positive and significant relationship with performance of food and beverage manufacturing firms in Kenya. The findings showed that warehouse automation, document automation and tender automation have an effect on the performance of food and beverage manufacturing firms in Kenya. This shows that an improvement in supply chain automation in terms of warehouse automation, document automation and tender automation, would lead to a subsequent increase in performance of food and beverage manufacturing firms in Kenya.

5.3.5 Supplier Capability

The study also concludes that supplier capability has a moderating effect on the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya. The findings showed that supply logistic capabilities, supply operation capabilities and supply structure capabilities have an effect on the performance of food and beverage manufacturing firms in Kenya. This implies that an improvement in supplier capability leads to an improvement in the relationship between supply chain scalability and performance of food and beverage manufacturing firms in Kenya.

5.4 Recommendations

5.4.1 Supply Chain Agility

Based on the significant positive effect of supply chain agility on firm performance, food and beverage manufacturing firms in Kenya should deliberately invest in agile supply chain capabilities. Specifically, firms should enhance distribution flexibility, shorten production and delivery lead times, and strengthen their ability to respond quickly to

changes in customer demand and market conditions. This can be achieved through adoption of real-time information systems, demand forecasting technologies, and flexible production scheduling systems. In addition, managers should institutionalize continuous product innovation and rapid decision-making structures that allow timely adjustments in sourcing, production, and distribution. Strengthening internal process coordination and eliminating operational bottlenecks will further enhance responsiveness and improve overall firm performance.

The findings also underscore the importance of collaborative and well-integrated supply chain relationships in supporting agility. Firms should therefore cultivate long-term strategic partnerships with key suppliers and distributors to enhance information sharing, joint planning, and synchronized operations. Establishing integrated communication platforms and transparent data-sharing mechanisms will enable better visibility across the supply chain network, reducing uncertainty and improving coordination. Furthermore, firms should diversify their product portfolio while maintaining cost efficiency and quality standards, ensuring that supply chain processes support both variety and speed. By aligning supply chain strategies with evolving market trends and customer expectations, firms can sustain competitive advantage and achieve improved performance outcomes.

5.4.2 Supply Chain Integration

The findings established a significant positive relationship between supply chain integration and the performance of food and beverage manufacturing firms in Kenya. Consequently, firms should strengthen both internal and external integration mechanisms to enhance coordination and operational efficiency. Internally, firms should integrate their information systems, procurement, production, warehousing, and distribution functions to ensure seamless flow of data and resources across departments. Externally, firms should adopt shared digital platforms that facilitate real-time information exchange with suppliers and distributors. Investing in integrated Enterprise Resource Planning (ERP) systems and synchronized planning tools will improve demand forecasting, inventory control, and

production scheduling, thereby enhancing operational performance and financial outcomes.

The study further highlights the importance of collaborative partnerships and resource sharing within the supply chain network. Firms should establish strategic alliances with key suppliers and logistics providers to promote joint planning, shared risk management, and collaborative problem-solving. Resource sharing, including joint transportation arrangements, warehousing facilities, and knowledge exchange initiatives, can reduce operational costs and improve flexibility. In particular, closer collaboration with transport companies can enhance delivery reliability, lower logistics costs, and improve customer satisfaction across the Kenyan market. By fostering trust-based relationships and structured information-sharing frameworks, firms can build resilient and competitive supply chains that support sustained organizational performance.

5.4.3 Value Chain Mapping

The findings revealed a significant positive relationship between value chain mapping and the performance of food and beverage manufacturing firms in Kenya. Based on this evidence, firms should institutionalize value chain mapping as a continuous strategic management practice rather than a one-time analytical exercise. Managers should systematically document and visualize all activities across procurement, production, distribution, and retail stages to identify inefficiencies, redundancies, and value-adding processes. The use of data overlays, process flow charts, and participatory mapping involving key stakeholders can enhance transparency and improve decision-making. By clearly identifying bottlenecks, waste points, and operational vulnerabilities, firms can streamline processes, reduce costs, and strengthen overall supply chain performance.

The study further suggests that value chain mapping enhances operational coordination through better scheduling and risk management. Firms should integrate backward and forward scheduling techniques into their value chain analysis to improve planning accuracy and responsiveness. Backward scheduling can help determine optimal

procurement timelines and production deadlines based on customer delivery requirements, while forward scheduling allows firms to adjust operations in response to real-time disruptions. Additionally, mapping governance structures and stakeholder relationships enables firms to strengthen coordination with suppliers and distributors, ensuring smoother product flow across the value chain. By embedding structured value chain mapping into routine strategic planning, firms can improve efficiency, responsiveness, and competitiveness in the Kenyan market.

5.4.4 Supply Chain Automation

The findings established a positive and significant relationship between supply chain automation and firm performance, underscoring the need for food and beverage manufacturing firms in Kenya to accelerate automation initiatives across their supply chain operations. Firms should prioritize the automation of warehousing, procurement documentation, tendering processes, and inventory management systems to reduce manual errors, enhance accuracy, and improve processing speed. Implementing integrated Enterprise Resource Planning (ERP) systems and other best-practice supply chain software will strengthen coordination across procurement, production, and distribution functions. Such integration enhances data visibility, improves resource utilization, and enables firms to manage larger order volumes efficiently while maintaining cost control and operational consistency.

The study further highlights the strategic value of automation in enhancing forecasting accuracy, customer service, and decision-making. Firms should adopt automated sales forecasting tools to support data-driven production planning and optimal resource allocation. Real-time tracking systems should also be implemented to improve order visibility and provide timely updates to customers, thereby enhancing transparency and customer satisfaction. Additionally, automation can support personalized customer engagement and faster response to market changes, strengthening brand loyalty and competitiveness. By embedding automation into core supply chain processes, firms can improve operational efficiency, reduce costs, and achieve sustained performance growth.

5.4.5 Supplier Capability

The findings confirmed that supplier capability plays a significant moderating role in strengthening the relationship between supply chain practices and firm performance. Therefore, food and beverage manufacturing firms in Kenya should strategically invest in developing and partnering with highly capable suppliers. This includes selecting suppliers with strong technical expertise, innovation capacity, quality assurance systems, and reliable contingency plans to ensure continuity of supply. Firms should also evaluate suppliers based on cost efficiency, delivery reliability, and responsiveness to changing market demands. Establishing structured supplier development programs, performance evaluation frameworks, and long-term partnership agreements will enhance supply chain resilience and amplify the performance benefits derived from supply chain strategies.

The study further underscores the importance of digital integration, knowledge sharing, and collaborative alignment with suppliers. Firms should integrate their IT systems with those of key suppliers to facilitate real-time information exchange, synchronized planning, and efficient logistics coordination. Strengthening digital connectivity improves transparency, reduces lead times, and enhances responsiveness to customer needs. Additionally, firms should promote joint training programs, technical workshops, and knowledge-sharing platforms to build supplier competencies and foster continuous improvement. By cultivating trust-based, technology-enabled, and strategically aligned supplier relationships, firms can enhance operational efficiency, innovation, and sustained competitive advantage in the Kenyan food and beverage manufacturing sector.

5.5 Areas for Further Research

This study sought to examine the moderating effect of supplier capability on the relationship between supply chain scalability and the performance of food and beverage manufacturing firms in Kenya. Specifically, the study assessed the effects of supply chain agility, supply chain integration, value chain mapping, and supply chain automation on firm performance. It further analyzed how supplier capability moderates the relationship

between supply chain scalability and performance. By addressing these objectives, the study provided empirical evidence on how internal supply chain practices and external supplier competencies jointly influence organizational performance outcomes.

Although the study focused on supply chain scalability and performance, it was limited to food and beverage manufacturing firms in Kenya. As such, the findings cannot be generalized to other manufacturing sub-sectors. Future studies should therefore examine similar relationships in other industries such as automotive, cement and allied industries, agro-processing, leather and footwear, pharmaceuticals, and paper manufacturing to enhance generalizability. In addition, the study established that 73.9% of the variation in firm performance was explained by supply chain agility, supply chain integration, value chain mapping, and supply chain automation, leaving 26.1% attributable to other factors. Further research should therefore explore additional determinants of performance and examine broader dimensions of value chain mapping and other strategic capabilities to expand the scope and depth of understanding in this area.

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APPENDICES

Appendix I: Introduction Letter

Dear Respondents,

I am a student at Jomo Kenyatta University of Agriculture and Technology (JKUAT) undertaking a PhD in Supply Chain Management. I am currently undertaking Research on **Supply Chain Scalability and Performance of Food and beverage manufacturing firms in Kenya.** I would like to request for your assistance by taking a few moments of your precious time to fill out this questionnaire. You are assured that all information received from the respondent will be treated with outmost confidentiality. Kindly respond sincerely to issues in the questionnaire. Please read and answer the questions given by ticking the correct answer. Where required write brief answers in the space provided.

Thank you in advance for participating in this study.

Feel free to get back to me with the contact below.

Yours faithfully,

AUGUSTINE ABADE

HDE423-C004-1164/2019

PHD STUDENT (SUPPLY CHAIN MANAGEMENT)

Jomo Kenyatta University of Agriculture and Technology

Appendix II: Questionnaire

Please fill out the questionnaire on: Influence of Supply Chain Scalability and Performance of Food and beverage manufacturing firms in Kenya Kindly mark with a [√] in the provided space; the response that best suits your response on the different statements.

SECTION A: BACKGROUND OF THE RESPONDENTS

1. Gender:

   Male [ ] Female [ ]

2. Age of the respondent?

   18-25 years [ ] 26- 30 years [ ] 31-35 years [ ] Over 35 years [ ]

3. What is your total work experience in procurement department?

   Less than 5 years [ ] 5 – 10 years [ ] 11 – 20 years [ ]

   21 – 30 years [ ] 31 years and above [ ]

4. How long have you worked in your organization?

   Less than 5 years [ ] 5 – 10 years [ ] 11 – 20 years [ ]

   21 – 30 years [ ] 31 years and above [ ]

SECTION B: SUPPLY CHAIN AGILITY

6. What is your level of agreement with the following statements that relate to the influence of Supply Chain Agility on performance of food and beverage

manufacturing firms in Kenya? Use a scale of 1-5 where strongly Agree=1, Agree=2, Not Sure=3, Disagree=4, and Strongly Disagree=5

	Statement	**1**	**2**	**3**	**4**	**5**
a)	Setting target for lead times and then working towards reducing those lead times specially "Order to Fulfillment" lead time					
b)	Organizations achieve the velocity that is needed to be Agile in today's competitive and changing business environment.					
c)	ability of an organization to respond rapidly to changes in demand, both in terms of volume and variety					
d)	Market sensitive — it is closely connected to end-user trends					
e)	Process integration — it has a high degree of process Interconnectivity between the network members.					
f)	Effectively integrating supply chain and forging close and long term relationship with customers and suppliers.					
g)	Innovative products and unstable demand typify agile supply drivers.					
h)	Delivering value to customers, Being ready for change, valuing human knowledge And skills, and forming virtual partnership					
i)	Produce a broad range of low-cost, high quality products with short lead times in varying lot sizes, built to individual customer specification					

7. How does supply chain agility influence your firm performance?

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……
……
……

SECTION C: SUPPLY CHAIN INTEGRATION

8. What is your level of agreement with the following statements that relate to the influence of Supply Chain Integration on performance of food and beverage manufacturing firms in kenya? Use a scale of 1-5 where strongly Agree=1, Agree=2, Not Sure=3, Disagree=4, and Strongly Disagree=5

	Statement	1	2	3	4	5
a)	Supply chain integration is creating cohesion and increasing connectivity throughout the entire value chain,					
b)	Functional Integration: each department in the same company works together to reduce costs.					
c)	Internal Integration: each department is now connected via the same IT infrastructure to increase efficiency.					
d)	**External Integration:** each company in the same supply chain joins hands and work together to achieve the same goal to satisfy the customer's requirements.					
e)	Allow for organizations to compete better on cost, by eliminating wasted time and materials, and having fewer middlemen.					
f)	Allow organizations to respond faster to changes in the market, and stake claims to new markets for an early advantage.					

g)	A raw materials supplier might collaborate with one or more transport companies to generate service and cost benefits for its largest manufacturing customers					
h)	Joint knowledge creation is the extent to which supply chain partners develop a better understanding of and response to the market and competitive environment					
i)	Resource sharing is the process of leveraging capabilities and assets and investing in capabilities and assets with supply chain partners.					

9. How does supply chain integration influence your firm performance?

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……

SECTION D: VALUE CHAIN MAPPING

10. What is your level of agreement with the following statements that relate to the influence of value chain mapping on performance of manufacturing firms? Use a scale of 1-5 where strongly Agree=1, Agree=2, Not Sure=3, Disagree=4, and Strongly Disagree=5

	Statement	1	2	3	4	5
a)	scheduling deadline that lies in the past, the system automatically carries out forward scheduling to determine a delivery deadline that can be confirmed					
b)	Define clearly market channels in a vertical manner culminating at end markets at the top of the map.					

c)	Present value chain governance by different types of connecting arrows showing a variant governance patterns associated with separate market channels.					
d)	Mapping is too simplistic a tool to describe the business enabling environment and its impact on value chains.					
e)	Depict product flow from inputs to final market					
f)	Help identify gaps or bottlenecks in production flow					
g)	Describe the value chain structure and relationships					
h)	backward scheduling determines a material-availability deadline or transportation-					
i)	The transportation lead time and the transit time for transportation scheduling are determined using the route.					

12. How does value chain mapping influence your firm performance?

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SECTION E: SUPPLY CHAIN AUTOMATION

13. What is your level of agreement with the following statements that relate to the influence of Supply Chain Automation on performance of food and beverage manufacturing firms in kenya? Use a scale of 1-5 where strongly Agree=1, Agree=2, Not Sure=3, Disagree=4, and Strongly Disagree=5

	Statement	1	2	3	4	5
a)	Automation keeps customers updated on order statuses in real time, and enables businesses to better serve customers.					
b)	An automated online ordering system produces is a point of communication that businesses can use to provide updates to customers during the entire order management					
c)	Automatic order tracking leads to a personalized customer experience with minimal manual intervention.					
d)	Fully-integrated, comprehensive suite of EPR business tools and capacity across all back office functions.					
e)	ERP systems incorporate best practices software reflects the vendor's interpretation of the most effective way to perform each business process					
f)	ERP systems connect to real–time data and transaction data in a variety of ways. These systems are typically configured by systems integrators,					
g)	The system allows shoppers to browse online catalogs, add items to a shopping cart and submit the payments electronically					
h)	The systems allow sales forecast figures for the various products and operational plan is derived from sales plan					
i)	The organisations use electronic data interchange (EDI) to manage supply chain management processes.					

14. How does supply chain automation influence your firm performance?

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SECTION F: SUPPLIER CAPABILITY

15. Please indicate the extent to which the following supply capabilities Use a scale of 1-5, where (1-Not at all, 2-small extent, 3-moderate extent, 4-large extent and 5-very large extent)

SC1	The firm successfully utilizes time-based logistics solutions like continuous replenishment, quick response and Just-in-Time with customers and/or suppliers.	1	2	3	4	5
SC2	The firm has active programs to capture the experience and expertise of individuals and transfer this knowledge throughout the organization.	1	2	3	4	5
SC3	The firm successfully integrates operations with customers and/or suppliers by developing interlocking programs and activities.	1	2	3	4	5
SC4	We have better IT infrastructure than most of our competitors	1	2	3	4	5
SC5	There are direct computer-to-computer links with our key supply chain partners	1	2	3	4	5
SC6	Our IT system is compatible with those of our supply chain partner	1	2	3	4	5
SC7	Our IT system can be seamlessly connected with those of supply chain partners	1	2	3	4	5
SC8	The company provides a number of rules, procedures and policies	1	2	3	4	5

16. How does supply chain agility influence your firm performance?

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SECTION G: PERFORMANCE OF FOOD AND BEVERAGE MANUFACTURING FIRMS IN KENYA

17. Please indicate the level of performance experienced by your organization in the last five years in terms by taking year 2013 as the base year.

Indicators	**Performance levels**				
Year	2013	2014	2015	2016	2017
Market share					
Lead Time					
Operational Costs					

Appendix III: List of Food and Beverages Manufacturing Firms in Kenya

	Name	Email
1	Africa Spirits Ltd	info@africaspirits.co.ke
2	Agri Pro-Pak Limited	sudhir@fruit-dale.com
3	Agriner Agricultural Development	agriner@africaonline.co.ke
4	Al-Mahra Industries Ltd	almahraindltd@yahoo.com
5	Almasi Beverages Limited	info@almasibeverages.co.ke
6	Alpha Fine Foods Ltd	affl@alphafinefoods.com
7	Alpha Grain Millers Limited	
8	Alpine Coolers Ltd	info@alpineone.com
9	Aquamist Ltd	info@aquamistwater.com
10	Aviano East Africa	anoop@avianoea.com
11	Bakers Corner Ltd	bakerscorner2011@yahoo.com
12	Bdelo Ltd	info@bdelo.com
13	Belfast Millers Ltd	info@belmill.com
14	Bio Food Products Limited	info@biofoods.co.ke
15	Bulto Foods Ltd	otienosally@yahoo.com
16	Candy Kenya Ltd	sales@candykenya.com
17	Chirag Kenya Limited	naturesown@swiftkenya.com
18	Confini Limited	sales@confiniltd.com
19	DPL Festive Ltd	admin@festivebrands.co.ke
20	East African Sea Food Ltd	easf.nairobi@ke.alphaafrica.com
21	East African Seed Co. Ltd	info@easeed.com
22	Edible Oil Poducts	info@nrb.mmm.co.ke
23	Elekea Limited	amisha@elekea.co.ke
24	Elle Kenya Limited	infor@ellekenyaltd.com
25	Erdemann Co. (K) Ltd	info@erdemann.co.ke
26	Europack Industries Limited	europack@chemrawea.com
27	Excel Chemicals Ltd	suresh@excel.co.ke
28	Frigoken Ltd	frigoken@frigoken.com
29	Giloil Company Limited	gillgroup@nbi.ispkenya.com
30	Glacier Products Ltd	d.pam@dairyland.co.ke
31	Global Fresh Ltd	info@globalfresh.co.ke
32	Gonas Best Ltd	business@gonasbestk.com
33	Green Forest Foods Ltd	info@greenforest.co.ke
34	Jambo East Africa Ltd	admin@britania.co.ke
35	Kamili Packers Ltd	info@kamilipackers.com
36	Kedsta Investment Limited	kedsta2@gmail.com
37	Kenafric Industries Limited	admin@kenafricind.com

38	Kenchic Ltd	info@kenchic.com
39	Kenya Co-Operative Coffee Dealers Ltd (KCCD)	kccd@kenaffee.coop
40	Kenya Highland Seed Co. Ltd	info@khs.co.ke
41	Kenya Sweets Ltd	sales@kenyasweets.com
42	Kenya Tea Development Agency	mkagure@ktdateas.com
43	Kenya Wine Agencies Limited	kwal@users.africaonlline.co.ke
44	Kirinyaga Flour Mills	
45	Koba Waters Ltd/ Broomhill Springs Water	info@broomhillsprings.com
46	Kuguru Food Complex Ltd	info@kuguru.com
47	Kwale International Company Limited	info@kwale-group.com
48	Kwality Candies & Sweets Ltd	info@candica.com
49	Landeco Ltd	kenyua@ifm.co.ke
50	Manji Food Industries Ltd	admin@dawda.net
51	Mashwa Breweries Ltd	mashwabrew@yahoo.com
52	Melvin Marsh International	sales@melvinstea.com
53	Mini Bakeries (Nbi) Ltd	info@minibake.com
54	Miritini Kenya	info@miritinikenya.com
55	Monwalk Investment Ltd	info@monwalkinvestments.com
56	Nairobi Bottlers Ltd	nairobibottlers@ke.ccsabco.com
57	Nairobi Flour Mills Ltd	nfm@jimbi.co.ke
58	New Kenya Co-Operative Creameries Ltd	info@newkcc.co.ke
59	Nicola Farms Ltd	info@nicola.co.ke
60	Patco Industries Limited	patco@patcoindustriesltd.com
61	Pearl Industries Ltd	info@frootokenya.com
62	Pembe Flour Mills Ltd	pembe@pembe.co.ke
63	Pernod Ricard Kenya Ltd	henry.kungu@perbold-ricard.m
64	Premier Flour Mills Ltd	admin@premierflour.co.ke
65	Premier Food Industries Limited	pfil@peptang.com
66	Propack Kenya Limited	info@propack-kenya.com
67	Purple Iris Africa	info@purpleirisafrica.com
68	Rafiki Millers Ltd	info@rafikimillers.com

Appendix IV: Measurement of Variables

Variable name	Indicator	Measure	Scale	Instrument
Supply chain agility	• Distribution Flexibility • Product Innovations • Reacting to change	Likert/Ordinal	5-point Likert scale	Questionnaire
Supply chain integration	• IT integration • Internal resources integrations • Supply Chain Collaboration	Likert/Ordinal	5-point Likert scale	Questionnaire
Value Chain Mapping	• Data overlays • documenting information • network research and participatory	Likert/Ordinal	5-point Likert scale	Questionnaire
Supply chain automation	• Warehouse automation • Document automation • Tender automation	Likert/Ordinal	5-point Likert scale	Questionnaire
Supplier capability	• Supply Logistic capabilities • Supply operation capabilities • Supply structure capabilities	Likert/Ordinal	5-point Likert scale	Questionnaire