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

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Abstract

Purpose: The purpose of the study was to evaluate the effect of supply chain visibility on the performance of food and beverage manufacturing firms in Kenya and to find out the moderating effect of supply chain technology on the performance of food and beverage manufacturing firms in Kenya.

Methodology: The exploratory research design was used in the study which utilized both qualitative and quantitative data. All 270 food and beverage manufacturing firms in Kenya registered by Kenya Association of Manufacturers (2022) were considered using the census approach. Target population for the research was one participant from logistics, supply chain or operations department at each of the registered food and beverage manufacturing firms. Primary and secondary data was used, the primary data was collected using semi structured questionnaire that was administered by the researcher and research assistants. Samples of the questionnaire were pilot tested to test the reliability and validity before full scale data collection. The data was analyzed using the Statistical Package for Social Sciences (SPSS) version 26 software. Quantitative data was analyzed using descriptive statistics while the inferential analysis was further carried out using structural equation modelling, ANOVA and regression coefficients to give effect of the explanatory variable.

Findings: The study found out that supply chain visibility significantly influenced the performance of food and beverage manufacturing firms in Kenya at both when there was a moderator and without a moderating variable, supply chain technology. In the first model without moderator, it recorded a standardized estimate of 0.538 ($p<0.000$), indicating that as supply chain visibility increases, performance of food and beverage manufacturing firms also increases. Fit indices on structural equation modelling revealed a marginal fit with a chi-square test of 211.322 with 86 degrees of freedom (P-value =0.0492). The structural path for structural equation modelling from supply chain visibility to supply chain performance remains positive and significant. Standardized estimate of 1.347 and p-value was $0.001<0.05$. Which indicates that the variability of supply chain visibility on the performance of food and beverage manufacturing firms could be explained by 53.8% when no moderator is included and increased to 134.7% when ,moderator, supply chain technology is incorporated thereby indicating a stronger relationship. The other fit indices that gave a satisfactory model fit when the moderator supply chain technology was used are RMR=.9196, GFI=.9263, NFI= .9473, RMSEA=.0184 and CFI=.9369 which implies that the model was fit to determine the relationship between supply chain visibility and performance of food and beverage manufacturing firms in Kenya and therein make conclusions and recommendations. ANOVA, regression coefficient and model summary (R^2) were also used and indicated significance for there use with all recording p-value of $0.000<0.05$.

Unique Contribution to Theory, Practice and Policy: System theory of management was adopted and validated. By incorporating supply chain enabling technologies in the management and planning of production in a manufacturing firm, it has the potential of revolutionizing the business environment hence increasing flow of raw materials and other items into the company's production plant, warehouses or retail locations in an effort to create visibility and enhanced performance. The theory can assist Kenya and the manufacturing firms in developing policies and strategies to assist manufacturing sector while creating competitive advantages through supply chain visibility. The study found out that some of the important supply chain mapping strategies to enhance performance of food and beverage manufacturing firms is supply chain visibility and supply chain technology.

Keywords: *Supply Chain Visibility, Supply Chain Technology, Supply Chain Performance*

INTRODUCTION

Food and beverage manufacturing firms offer ready market for raw materials for producers, and through manufactured products, customers are contented when quality products are offered readily at a fair price from nearby retail outlets. Firms dealing in the manufacture of food and beverages have started to incorporate the aspect of supply chain visibility (SCV) in their strategic production planning aimed to boost production capacity and performance. This starts with the sourcing of raw materials from suppliers through to the end product to consumers, information flow, processes and money that goes throughout the supply chain, both upstream and downstream, (Schmitz, 2016). However, for a company to effectively coordinate supply chain, it has to invest in technology and big data throughout its supply chain (Büyüközkan & Göçer., 2018). According to Mubarik *et al* (2021), firms tend to adopt a supply chain mapping strategy in order to help in improving on their Supply chain visibility and resilience.

Supply chain visibility (SCV) refers to the extent to which actors within the supply chain (SC) have access to the timely and accurate information that they consider to be key or useful to their operations (Barratt and Barratt, 2011). Increased production by food and beverage manufacturing firms depends on the activeness and acceptance of retail outlets to stock firm's products with expanded network of firm products within the market segment. On the other hand, success of fast-moving consumer goods (FMCG) companies has a direct relationship with performance of leading retailer outlets which are their main channel of distribution (Mathu & Phetla, 2018). The premise of using supply chain visibility across multiple tiers aimed at achieving business objectives is gaining interest (Patsavellas, Kaur & Salonitis., 2021). Therefore organizations may reap the benefits of supply chain mapping by gaining greater supply chain visibility. However, during disruptions firms that can gain competitive advantage are those using supply chain visibility strategic plannings to aid in operations. According to Nemuel, (2017) supply chain disruptions can be very severe to the productivity of manufacturing firms and that firms rely on suppliers for sustained smooth operations and customers for continued revenue earnings. The sustenance of supply chain operations within an organization is vital for overseeing local and global levels of sustainability (Khan *et al.,* 2022).

Essential to supply chain visibility (SCV) is the mapping process which involves scanning the environment to trace for potential suppliers of raw materials and end product customers. For a manufacturing firm to maintain that voluminous data, proper documentation is necessary therefore calling to the adoption of supply chain technology by the firms. Mapping of suppliers by a manufacturer enables the firm to visualize technologically the connectivity of all partners along its supply chain. This starts with the sourcing of raw materials from suppliers through to the final end product to consumers, information flow, processes and money that goes throughout the supply chain, both upstream and downstream, (Schmitz, 2016). However, the technology will help in managing and coordinating its supply chain visibility strategies while targeting to increase profit margins. Sustainability is a global concern in today's company, which forces companies to be cautious in order to remain competitive (Oláh *et al*., 2019). The basic goal of supply chain value mapping for an organization is to create value that is greater than the cost of providing the product or service, resulting in a profit margin.

Statement of the Problem

In the past supply chain visibility has not been considered as a major factor for performance measure to manufacturing firms. The presence of firm products and network mainly for food and beverage manufacturing firms remain a problem given the perishable nature of most products. Despite the fundamental importance of food and beverage manufacturing firms in Kenya, it is besieged by an array of formidable challenges, hampering the performance of F & B manufacturing firms and the desired economic development. Kenyan manufacturing sector has persistently contributed a staggering 10% to the county's GDP for over 10 years. However, the percentage is yet to be considered sustainable. According to Kenya National Bureau of Statistics (KNBS, 2023) economic survey, performance of manufacturing sector grew by 2.7% to 10% from 7.3 per cent (7.3%) recorded in 2021. Contribution of manufacturing sector to GDP was 7.8% but Kenya national bureau of statistics (KNBS) project a decelerate in global economy in 2023 due to tightening of monetary policies, high inflation, the ongoing Russia-Ukraine war and lingering effects of COVID-19 pandemic.

Considering the dynamic nature of the food and beverage sector, supply chain capabilities such as supplier chain visibility needs to be investigated as a potential contributor to enhanced performance of food and beverage manufacturing firms. Better supply chain responsiveness (Kim *et al*., 2006), enhanced measurement (Acquaye *et al*., 2014) and design of key metrics (Caridi *et al*., 2013), improved productivity, customer service, and overall firm performance can all be achieved by effectively undertaking supply chain visibility strategies. A study on Supply chain resilience and internal integration had established that supply mapping positively influences the development of supply chain resilience (Mandal, 2017). However, studies from American firms found out that firms with high visibility achieve higher profitability compared to firms with less visibility (Swift *et al*., 2019). Mostly a number of studies have been conducted in developed countries relating to supply chain visibility strategies and organizational overall performance such as the ones by Mandal (2017) and Swift *et al*., (2019). However, in developing countries, particularly in Kenya limited research exists in this area. Thus the study therefore aims to determine the effect of supply chain visibility strategies on the performance of food and beverage manufacturing firms in Kenya.

Objectives of the Study

1. To evaluate the effect of supply chain visibility on the performance of food and beverage manufacturing firms in Kenya.
2. To examine the moderating effect of supply chain technology on the performance of food and beverage manufacturing firms in Kenya.

Research Hypothesis

H_{o1}: There is no significant effect between supply chain visibility and the performance of food and beverage manufacturing firms in Kenya.

H_{o2}: There is no significant influence between the moderating effect of supply chain technology and the performance of food and beverage manufacturing firms in Kenya.

LITERATURE REVIEW

To determine the effect of supply chain visibility and performance of food and beverage manufacturing firms in Kenya, the study was adopted system theory of management.

System Theory of Management

Systems theory is one of the dominant organizational theories in management today. Systems theory treats an organization as a system and the system can be closed or open, but most approaches treat an organization as an open system. Organizational tools shape the products and services they produce in unanticipated ways (Scott & Davis, 2015). Scott and Davis further asserts that in some cases "accounts" for outcomes indicates the quite substantial impact that organizations have to individual activity.

Systems theory of management will continue to provide managers and students of organizations with metaphors, terminology and explanations about how organizations function (Millett, 1998). The theory has dominantly been used as a framework for managerial behaviour and organizational analysis. Since the introduction of the computer as a business tool, computers role has become increasingly complex (Mcleod Jr, 1995). However, Chua (2009) assert that the idea of adopting and using supply chain management enabling technologies such as electronic data interchange (EDI) to connect trading partners is not new. Advancement in telecommunications have revolutionized business computing and driven concurrent changes in the business environment (Chua, 2009).

Systems can be used to manage vendors and customers efficiently through vendor management inventory (VMI). VMI is an exercise where companies' suppliers and other vendors are responsible for the flow of raw materials and other items into the company's plants, warehouses or retail locations in an effort to streamline inventory levels (Saxena & Gupta, 2015). The key advantage in the use of VMI in a manufacturing process for an organization is that it eliminates need for large storage and warehousing space for inbound inventory. The VMI is a waste reduction solution thus promoting a lean supply chain (Battini, Hassini, Manthou, Guimarães, de Carvalho & Maia., 2013).

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Conceptual Framework

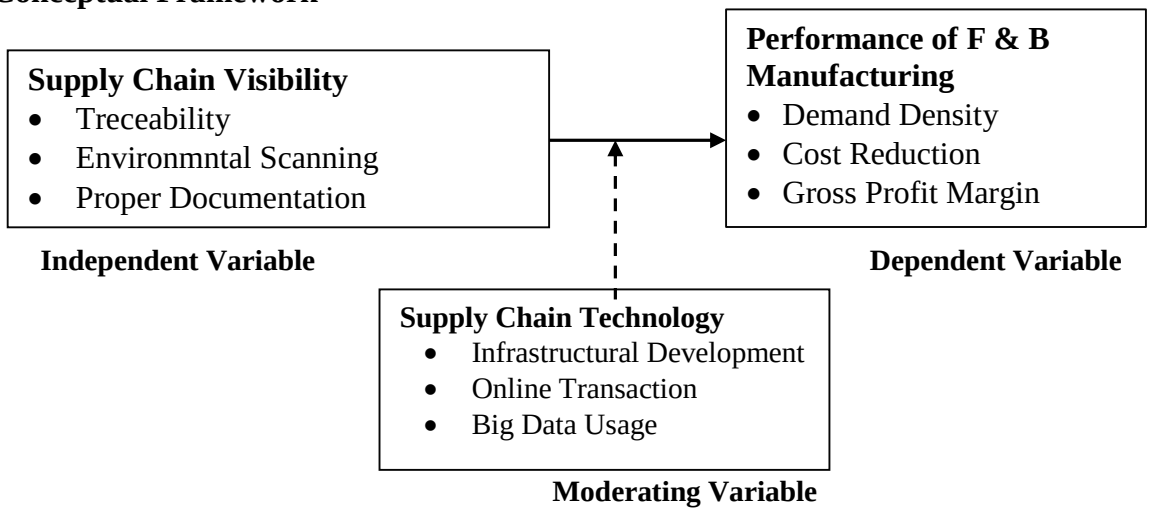

Figure 1: Conceptual Framework

Supply Chain Visibility

Supply chain visibility, for example, is a spatial representation of a specific geographical location that conveys data such as connectivity, proximity to other land uses, and other resources. It depicts truth and conveys the essence of the natural world. Furthermore, it extends beyond a single person's vision. A supply chain contains these qualities. As a result, a supply chain visibility map can be characterized as a diagram that depicts the relationships between suppliers and customers. It depicts the reality of the supply chain by visualizing the connectivity of all stakeholders throughout the supply chain, from raw material suppliers to end consumers, as well as the flow of items, information, procedures, and money that moves upstream and downstream (Yacher, 2011). It goes beyond the individual and their visions, assisting in the communication and implementation of the firm's visions and objectives as a whole. Mapping is an attribute representation of the environment that serves as a substitute for the real thing and that a map is a visual method of communication that conveys information (Muehreke & Murhreke, 2003). A good strategic supply chain map should consist with key characteristics such as (M Theodore Farris, 2010); Easily interpretable, Easily recognizable, Easy to disseminate, Use of standardize icons, should capture multiple levels and Should be information rich but should not overloaded with unnecessary information.

Procuring entities may quickly discover suppliers based on the information offered, allowing them to make more educated decisions. A manufacturer's mapping of suppliers allows the company to understand its supply chain partners and there connection. This starts with the sourcing of raw materials from suppliers through to the final end product to consumers, information flow, processes and money that goes throughout the supply chain, both upstream and downstream, (Schmitz, 2016). However, in order for a company to effectively coordinate supply chain mapping visibility, it has to invest in technology and big data usage throughout its supply chain (Büyüközkan & Göçer., 2018). By implementing the Achilles supply chain mapping system, the firm will be able to reduce the risk of financial loss, reputational damage, and even legal action. Sustainability is a global concern in today's company, which forces companies to be cautious in

order to remain competitive (Oláh *et al*., 2019) as they implement supply chain visibility. To achieve an optimal supply chain performance, it is necessary to map the supply chain to display the overall connectivity and visibility of each partner in the system. There are several important reasons why a supply chain manager should consider having a strategic supply chain map for decision making (Gardner & Cooper, 2003). Enhance strategic planning process, Support information distribution, Support supply chain design and configuration and enhances overall supply chain performance.

Supply Chain Technology

Manufacturing firms in modern business environments have integrated technology in operations where big data management is key. The advancement in technology driven manufacturing is likely going to provide additional impetus notwithstanding Covid-19 (Free & Hecimovic, 2021). With the growing business environment, use of big data is a growing torrent among manufacturing entities and big data in-depth can be collected into the production process and compared with other similar production systems (Subramaniyan, 2015). Big data is helping companies to manage more responsive supply chains to comprehend customers and understand market trends, while dealing with massive datasets (Wang, Tsai & Ciou., 2020). with the latest technology analytics, big data offers companies quick access from massive volumes of structured and unstructured data coming from multiple sources (Akter & Wamba, 2016). However, adoption of big data analytics help a firm to predict potential customer demands while storing other inactive data for future use, (Wang *et al*., 2020).

Companies are able to track the behavior of every user of a product and determine the best effective ways to convert one-time customers into repeat buyers through big data. For supply chain managers, this strategy can help boost visibility and deliver more in-depth insights into the entire supply chain. Big data support firms to leverage and supports sustainable supply chain management outcomes, (Bag *et al.*, 2020). Firms competitive capacity is enhanced when managers establishment work climate through practices that support operation, infrastructure and ensuring that customers are served promptly (Akintokunbo and Akpotu, 2020). The massive growth in the scale of big data generated via cloud computing has a challenging and time-demanding task and requiring large computerized infrastructure for guaranteed successful data processing and analysis, (Hashem, Yaqoob, Anuar, Mokhtar, Gani, & Khan., 2015).

Food and beverage manufacturing firms should invest in technology for a better and enhanced performance. The investment should focus on dependable infrastructure where the system being used must support organizational operations. Acquired computers matching operational needs may be installed and management has to prioritize its spending in the budget planning by allocating the expenditure on computer acquisition and installation of technological infrastructure ahead before the start of the financial year. According to Copra and Sodhi (2014), many companies have invested in a variety of information technology (IT) systems for monitoring materials flows such as delivery and sales, information flows (demand forecasts, production schedules and inventory level plus information on quality) to boost performance and also manage recurrent risks. Implementation of IT in supply chain management can integrate and coordinate material flows, finances and information among suppliers, (Kumar *et al*., 2018).

Organizations must digitalize their operations to match the current market situations. While making such decisions they must take into account the necessity for the firm to use and handle big data. The use of bid data in supply chain mapping provides the organization with unique insights about market trends, customer buying patterns and maintenance cycles and finally ways of lowering costs both at purchase and inbound logistics and outbound logistics (Wang, Gunasekaran, Ngai & Papadopoulos, (2016). According to Ramkumar and Jenamani adoption of technology in supply chain and operations can be of two ways, one optional and the other mandatory from the law like in India as per Central Vigilance Commission Act which has made it mandatory for e-procurement in public sector organization (Ramkumar and Jenamani, 2012).

Performance of Food and Beverage Manufacturing Firms

Performance of food and beverages manufacturing firms strongly rely on other companies in the same line of production. Performance measurement is the process of quantifying action where measurement is the process of quantification and action leads to performance (Cagno, Neri, Howard, Brenna and Trianni, 2019). Cagno *et al.*, (2019) further assert that it is important for a manufacturing firm to collaborate in order to satisfy customer requirements with greater efficiency and effectiveness than its competitors. The mass production alerts manufacturing firms to undertake inventory control which is retained at reasonable level to service customers demand thereby minimizing total costs and maximizing profit (Nagib, Adnan, Ismail, Halim, & Khusaini., 2016).

According to Islam *et al.*, (2013) both identified six key performance indicators namely; transport time, transport cost, reliability, flexibility, quality and sustainability should be adopted by manufacturing firms for fast procurement decisions. Internal stakeholders need to understand when specific actions can be undertaken as they target to increase sustainability of performance of the firm (Cagno *et al.*, 2019). However, the assessment of sustainable performance is therefore necessary for the firms to identify which measures could be adopted. To guarantee future performance, a manufacturing firm has to rely on big data to aid in strategy enhancement since modern market is dynamic, global and competitive, (Sarpong, 2014).

Most manufacturing industries are always under constant pressure to improve their productivity (Subramaniyan, 2015). In such scenarios, manufacturing firms engage in inter firm coordination in order to secure the production orders. Such collaborations work well through mapping of suppliers and producers in the same line of production. Beverage manufacturing companies largely rely of dependable logistical channels, long standing contract with suppliers and accurate relaying of information and data for action by the management. The sharing information with suppliers has benefits to manufacturers since it creates responsiveness of supply chain partners, and enhanced measurement (Acquaye *et al*. 2014) and designing of key metrics (Caridi *et al*. 2013), better productivity, customer service and overall firm performance. Implementation process of strategic management requires putting strategies into action. However, if the strategy cannot be translated into action, then the resources and the energies put forth are worthless (Alkhafaji & Nelson, 2013).

Food and beverage manufacturing firms while engaging with suppliers should adapt to various stocks conditions; perishable inventory, special sale and shortage, or deteriorating items with shortages and time varying demand, (Nagib *et al.*, (2016). However, Kashmanian et al.,(2014) further assert that suppliers that have multiple customers may also have to initiate multiple supplier codes of conduct with which they must conform. Coca-cola company has developed a set of sustainable agriculture guiding principles (SAGP) to give guidance to the growers of its agricultural ingredients and works with its suppliers to ensure that these ingredients are sustainably sourced (Kashmanian *et al*., 2014). The SAGP are deployed to ensure the company, which has a global presence maintain un disrupted manufacturing as a cost reduction measure while ensuring there is consistency in growth of company gross profit margin. Meanwhile, manufacturing firms could benefit through reduction on inventory related costs due to replenishment policy and adhering to minimum and maximum stocks (Oláh *et al*., 2017). Organizations should take charge of their supply chains to gain competitive advantage by initiating cost-reduction strategies that include quality, cost, flexibility, delivery and innovation as the most significant business contributors (Fawcett, Ellram & Ogden., 2007). The integration of warehouses helps to fulfill demand from a backup warehouse during disruptions at an allotted warehouse (Singh *et al.*, 2021).

METHODOLOGY

Exploratory research design was used in the study and both qualitative and quantitative data was utilized to help the researcher to perform in-depth examination of variables under study. Census method was used to collect data from all 270 food and beverage manufacturing firms as registered by Kenya association of manufacturers (KAM, 2022) thereby forming the unit of analysis. Census survey is appropriate data collection design for population of this size (Saunders *et al.*, 2009; Kothari, 2008). The study used 270 questionnaires and one questionnaire was administered to one food and beverage manufacturing firm by the researcher assisted by appointed research assistants. The target population for the study were senior managers (respondents) from the following departments; logistics, supply chain and operations, who deal with the day to day activities and operations at the food and beverage manufacturing firms. The research questionnaire comprised both structured and semi-structured questions.

Pilot test was conducted on 27 food and beverage manufacturing firms thereby representing 10% of the target population. According to Lancester, Dodd and Williamson, (2004) the sample size for high precision pilot studies should be between 1% and 10%. Research data was analyzed using structural equation modelling (SEM-R) and statistical package for social sciences (SPSS) version 26 software. Descriptive statistics was used to analyze quantitative data through percentages, means, standard deviation. A regression coefficient, model summary and ANOVA was further used to test the relationships between the independent, moderating and dependent variables. Goodness of fit indices and ANOVA were used to test the significance and the relationship of independent variable and moderating variable on the dependent variable and the validity.

FINDINGS AND DISCUSSIONS

Descriptive Analysis of Supply Chain Visibility

The respondents for the study were asked to indicate the extent to which they agreed with the effect of supplier collaboration on the performance of food and beverage manufacturing firms in Kenya.

Five-point Likert scale where 1= Strongly Agree, [SD], 2= Agree [A], 3= Neutral [N], 4= Disagree [D], 5= Strongly Disagree [SD] was used as shown in Table 1 shown below.

Analysis of the study parameters as indicated in Table 1 revealed that majority of the respondents agree that the company continuously traces/identifies all potential risks and mitigates them across the supply chain by (Mean=3.803, SD=1.3162). The second statement, majority of the respondents agree that environmental scanning is executed in a bid to understand the sub sector's supply chain requirements by (Mean=3.881, SD=1.3155). Moreover, the third statement had majority of the respondents agreeing that the company had digitized its records and had good record of transactions, policies and procedures on documented suppliers and customers with (Mean=3.664, SD=1.0958). The other statement, the respondents largely greed with the statement that the company has invested in expertise personnel for enhanced operations with (Mean =3.757, SD= 1.2446). On the aspect of whether the company has policies that guide scalability of the supply chain and traceability of transactions and production needs, majority of the respondents agreed with the statement with (Mean =3.602, SD= 1.9686). The respondents further agreed that logistical technologies (RFID chips, bar-codes) are used to track shipments while on transit as evidenced (Mean = 3.714, SD= 1.1794), while on the last statement that the company employs supply chain research as a mapping tool majority of the respondents agreed with the statement as shown by (Mean =3.7065, SD=1.1304). The study findings imply that food and beverage manufacturing firms have integrated supply chain visibility strategies within their management and operation strategies which has a positive impact on their performance.

Table 1: SC Visibility on Performance of Food & Beverage Manufacturing Firms

Aspects of Supply Chain Visibility	N	Mean	SD
1. The company continuously traces/identifies all the potential risks and mitigates them across the supply chain.	270	4.803	1.3162
2. Environmental scanning is executed in a bid to understand the sub sector's supply chain requirements.	270	3.881	1.3155
3. The company digitizes its records and maintains good record of transactions, policies and procedures on documented suppliers and customers.	270	3.664	1.0958
4. The company has invested in expertise personnel for enhanced operations.	270	3.757	1.2446
5. The company has policies that guide scalability of the supply chain and traceability of transactions and production needs.	270	4.602	1.9686
6. Logistical technologies (RFID chips, bar-codes) are used to track shipments while on transit.	270	3.714	1.1794
7.The company employs Supply chain research as a mapping tool.	270	4.7065	1.1304

Supply Chain Technology

The study parameters in Table 2 below revealed that supply chain technology influences performance of food and beverage manufacturing firms. Investment in infrastructure by companies had been initiated to manage exchange of knowledge within its cross functional departments showed (Mean= 2.826, SD=1.2386). Use of company online platforms to manage operations and transactions was supported by majority of the respondents with (Mean=3.675, SD=1.0979). However, majority of the respondents also supported the statement that big data and block chains were employed across the supply chain to enhance operations (Mean=3.772, SD=1.0981). Regarding statement inquiring whether a company had streamlined all modes of interaction and communication among other firms and partners it recorded (Mean= 3.745 , SD=1.1799). Meanwhile, real time data usage as a basis for decision making and production scheduling recorded a Mean of 3.726 and standard deviation of 1.1606. In addition, about the company achieving supply chain optimization through installed artificial intelligence (AI) and machine learning, this recorded the highest with (Mean=3.847, SD=1.1908). The aspect about company having adopted a reliable platform to secure big data and other operational information was largely supported by the respondents (Mean=3.758, SD=1.0596). The study findings, therefore, led to the acceptance of the statement and concluded that there is a positive and significant relationship between supply chain technology and the performance of food and beverage manufacturing firms.

Table 2: SC Technology on Performance of F & B Manufacturing Firms

	N	Mean	SD
1. The company invested in technology manage the exchange of knowledge within its cross-functional departments.	270	2.826	1.2386
2. The company uses online platforms to manage her operations and transactions.	270	3.675	1.0979
3. Big-data and block chains are employed across the supply chain to enhance operations.	270	3.772	1.0981
4. The company streamlines all modes of interaction and communication among other firms and partners.	270	3.745	1.1799
5. Real-time data is used as a basis of decision making and production scheduling.	270	3.726	1.1606
6. The company achieves supply chain optimization through installed artificial intelligence and machine learning.	270	3.847	1.1908
7. The company has adopted a reliable platform to secure her big data and other operational information.	270	3.758	1.0596

Performance of Food and Beverage Manufacturing Firms

The analysis of the study parameters on performance of food and beverage manufacturing firms revealed that supply chain performance had a positive impacts on manufacturing firms. The respondents supported the statement that efficient performance of food and beverage companies depended on the firm's sales growth and market share, recording with (Mean=4.614, SD=.8481). The second statement which was also positively supported was cost reduction as the key towards

efficient performance for food and beverage manufacturing firms (Mean=3.795, SD=1.1000). The third aspect was about continuity of the firm being influenced by increased profit margins realized by a manufacturing firm and used to expand and sustain operations, this was supported by majority resulting to the highest(Mean= 4.799, SD=1.8521). Regarding mass production and its ability to help a firm to reduce operational costs through discounted prices and credit supply from suppliers, respondents strongly agreed with the statement thereby recording (Mean=2.757, SD=1.4777). Expanded market share stimulating production capacity within food and beverage manufacturing firms, respondents strongly agreed thereby recording (Mean= 3.722, SD= 1.0115). Finally, on firms expansion strategy largely relying on firm's sales growth and profit margins recorded within a particular financial period it had (Mean= 3.722, SD= 1.0115). From the study findings, this led to the acceptance of the statement and concluded that there is a positive and significant relationship between supply chain mapping strategies and performance of food and beverage manufacturing.

Table 3: Performance of Food and Beverage Manufacturing Firms

Aspects of Performance of Food and Beverage Man. Firms	N	Mean	SD
1. Efficient performance of food and beverage companies depends on the firm's sales growth and market share.	270	4.614	.8481
2. Cost reduction is key towards efficient performance for food and beverage manufacturing firms.	270	3.795	1.1000
3. For a company to enhance its production capacity there must be a business continuity plans in place.	270	3.618	.9945
4. Continuity of the firm is influenced by increased profit margins realized by a manufacturing firm and used to expand and sustain operations.	270	3.807	1.4686
5. Mass production helps a firm to reduce operational costs through discounted prices and credit supply from suppliers.	270	4.799	1.8521
6. Expanded market share stimulates production capacity within food and beverage manufacturing firms.	270	2.757	1.4777
7. Firm expansion strategy largely relies on firm's sales growth and profits margins.	270	3.722	1.0115

Data Processing and Analysis using Structural Equation Modeling

The total target population used was 270 food and beverage manufacturing firms registered by Kenya Association of Manufacturers (2021). The findings from the structural equation modeling (SEM) provided valuable insights into the interplay between Supply Chain Visibility (SCV) and the Performance of Food and Beverage Manufacturing Firms (SCP) in two distinct models. The first model, which had no moderator variable, supply chain technology, revealed a positive and statistically significant relationship between SCV and SCP. The standardized path coefficient (Std)

was reported as 0.538, with an un-standardized estimate (UnStd) of 0.442. However, the associated standard error (S.E.) was 0.049, and the critical ratio (C.R.) was 8.948, indicating a strong and significant positive relationship between supply chain visibility and performance of food and beverage manufacturing firms. The p-value for this association was less than 0.001, underscoring its statistical significance.

The goodness of fit indices for the model without the moderator further supported its adequacy. The Chi-square test (CMIN) yielded a value of 211.322 with 86 degrees of freedom (DF), resulting in (p-value = 0.0492). The ratio of CMIN to DF was 2.457, suggesting an acceptable fit. Other fit indices, including the Root Mean Square Residual (RMR), Goodness of Fit Index (GFI), Adjusted GFI (AGFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI), which all fell within acceptable ranges. The Root Mean Square Error of Approximation (RMSEA) was 0.0199, indicating a good fit of the model to the data. RMSEA in the range of 0.05 to 0.10 is considered an indication of a fair fit, value above 0.10 indicate a poor fit (MacCallum *et al*., 1996). However, an RMSEA and in a well fitting model lower limit value should be close to 0 while the upper limit should be less than 0.08 (MacCallum *et al*., 1996).

Meanwhile, in the second model, where the moderator variable supply chain technology (SCT) was introduced, the relationship between SCV and SCP remained significant, with a higher standardized path coefficient (Std = 1.347) and un-standardized estimate (Un-Std = 1.082). Additionally, the interaction term SCV*SCT was introduced, with a significant (Std = 0.245, and UnStd =0.121). The SCT variable itself had a negative relationship with SCP, as indicated by a standardized path coefficient of -0.793 and an un-standardized estimate of -0.550. All of these relationships had statistically significant as the have p-values less than 0.001. The fit indices for the model with the moderator remained robust, with a Chi-square value of 206.21, 100 degrees of freedom, (p-value= 0.0611). The CMIN/DF ratio was 2.0621, indicating a reasonable fit. The other fit indices, including RMR, GFI, AGFI, NFI, IFI, TLI, and CFI, all suggested a good fit for the model. The RMSEA was 0.0184, supporting the overall adequacy of the model fit according to MacCallum *et al*., (1996).

In summary, both models provided support for a significant relationship between SCV and SCP, with the second model introducing a moderator (SCT) to enhance the understanding of these dynamics. The fit indices for both models indicated their appropriateness in explaining the observed data patterns, thereby offering valuable insights for practitioners and researchers in the field of food and beverage manufacturing supply chains.

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Table 4: Model Fitted and Goodness Fit between Supply Chain Visibility (SCV) and Performance of Food and Beverage Manufacturing Firms (SCP) without and with Moderator (SCT)

			Std Estimates	UnStd Estimates	S.E.	C.R.	P
Model 2: Supply Chain Visibility(SCV) with Performance of Food and Beverage Manufacturing Firms (SCP) with No Moderator (SCT)							
SCP	<---	SCV	.538	.442	.049	8.948	***
Fit indices for model without Moderator				**CMIN**	**DF**	**P**	**CMIN/DF**
		Default model		211.322	86	.0492	2.457
				RMR	**GFI**	**AGFI**	**PGFI**
		Default model		.9080	.8646	.8911	.9068
				NFI	**IFI**	**TLI**	**CFI**
		Default model		.9171	.9078	.9174	.91780
				RMSEA	**LO 90**	**HI 90**	**PCLOSE**
		Default model		.0199	.0193	.0216	.000
Model 2: Supply Chain Visibility(SCV) with Performance of Food and Beverage Manufacturing Firms with Moderator (SCT)							
SCP	<---	SCV	1.347	1.082	.072	14.956	***
SCP	<---	SCV*SCT	.245	.121	.032	3.808	***
SCP	<---	SCT	-.793	-.550	.062	-8.935	***
Fit indices for model with a Moderator				**CMIN**	**DF**	**P**	**CMIN/DF**
		Default model		206.21	100	.0611	2.0621
				RMR	**GFI**	**AGFI**	**PGFI**
		Default model		.9196	.9263	.9049	.9346
				NFI	**IFI**	**TLI**	**CFI**
		Default model		.9473	.9571	.9229	.9369
				RMSEA	**LO 90**	**HI 90**	**PCLOSE**
		Default model		.0184	.0186	.0195	.000

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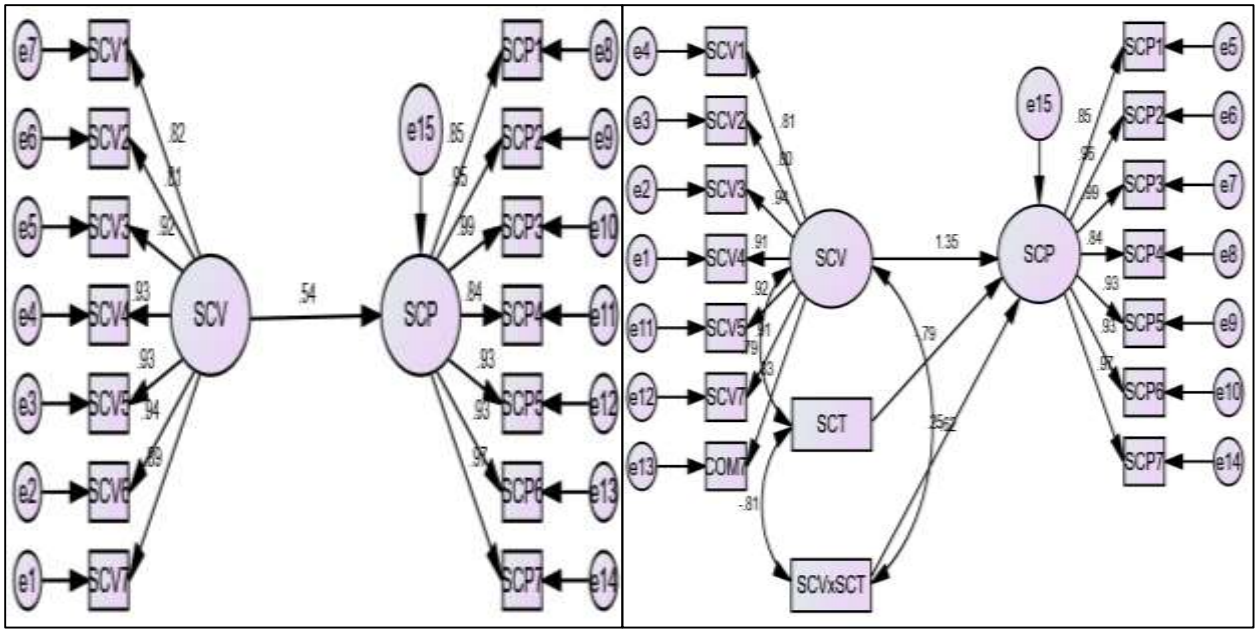

Figure 2: Structural Equation Model on Supply Chain Visibility (SCV) and Performance of Food and Beverage Manufacturing Firms (SCP) without and with Moderator (SCT)

Test of Hypothesis

The study sought to test for the hypothesis in order to ascertain the effect of supply chain visibility on the performance of food and beverage manufacturing firms in Kenya.

H_{01}: There is no significant influence between supply chain visibility and performance of food and beverage manufacturing firms in Kenya.

The study objective was to determine how supply chain visibility affect the performance of food and beverage manufacturing firms in Kenya. The purpose was to statistically determine how supply chain visibility (independent variable) affects the performance of food and beverages manufacturing firms in Kenya (dependent variable). The regression coefficient, model summary and the ANOVA test were used to accomplish this. This made it possible for the researcher to decide whether to accept or reject the null hypothesis or not. The model equation used for the study variable was, $\mathbf{Y= \beta_0 + \beta_1 X_1}$.

Model Summary on Supply Chain Visibility

The model summary results provided in Table 5 shows R value of 0.512 and R^2 of 0.262, indicating that up to 26.2% of the model could account for the variability of supply chain visibility on the performance of food and beverage manufacturing firms in Kenya. This suggests that the model was suitable to ascertain the correlation between the two variables and drawing of findings and suggestions on the result.

Table 5: Model Summary on Supply Chain Visibility

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.512[a]	.262	.259	.75548

a. Predictors: (Constant), Supply Chain Visibility, Supply Chain Technology
b. Dependent Variable: Performance of Food and Beverage Manufacturing Firms

Analysis of Variance (ANOVA) Test on Supply Chain Visibility

An ANOVA test as shown in Table 6 was performed to further certify the relationship between supply chain visibility and performance of food and beverage manufacturing firms in Kenya. The findings indicated that the model was significant since the F- calculated for the variance was 89.084, which is higher that the F-critical of value of 50.845. The model was therefore significant as further demonstrated by p-value (0.000<0.05) considering that the P-value (0.000<0.05).

Table 6: Supply Chain Visibility

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	50.845	1	50.845	89.084	.000[b]
	Residual	143.260	251	.571		
	Total	**194.105**	**252**			
a. Dependent Variable: Performance of F & B Man. Firms						
b. Predictors: (Constant), Supply Chain Visibility and Supply Chain Technology						

Table 7: Coefficient of Supply Chain Visibility

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	1.192	.060		.734	.000
	SCV_SCT	.468	.009	.512	29.438	.000
a. Dependent Variable: Performance of Food and Beverage Man. Firms b. Predictors (Constant): Supply Chain Visibility, Supply Chain Technology						

As shown in Table 7 the unstandardized coefficient for the variable was 0.468 and the p-value is 0.000. the new model now becomes $\mathbf{Y=1.192 + 0.468X_1 + \varepsilon}$ this implying that at a significant level of 0.000, supply chain visibility will impact the performance of food and beverage manufacturing firms by up to 46.8%. the findings also indicate that t-statistics (29.438) is higher that the t-critical (0.734) an indicator that supply chain visibility significantly influences performance of food and beverage manufacturing firms.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

In a changing and challenging environment, food and beverage manufacturers have to venture into the promotion of their supply chains beyond normal and traditional operations. However, without the incorporation of supply chain visibility strategy their operations could rapidly decline or even worsen thereby putting tracing and scanning of of the production and end markets in doubt. From a managerial perspective, it becomes necessary to understand and try effectively to manage all the supply chain interruptions that could negatively influence business performance thereby impede organizational expansion and profitability. Manufacturing firms needs to realize the importance of remaining resilience in undertaking operations through supply chain visibility and incorporating technology within their business plannings since it guarantees enhanced performance for food and beverage manufacturing firms.Companies should cluster their products and raw materials by segmenting those that can be sourced locally and those that are critical in nature that require secured contracts to document the suppliers and items to be sourced as it aims to increase profit margins thus improving firms performance and sustainability.

Recommendations

The study recommended that Food and beverage manufacturing firms in Kenya should observe and develop capabilities to adapt in their operations to manage business dynamics such as traceability, environmental scanning to get dependable and reliable cost effective partners and stakeholders and endeavour to have a system for integrating whole data pertaining operations of the manufacturing firm. Supply chain visibility is often characterized by traceability, environmental scanning and proper documentation. Specifically, a manufacturing firm can have the liberty of entering into business partnerships with raw material suppliers ostensibly to reduce risks of raw material shortage by securing supplies within the network and from those firms they have entered and partnered with. With correct environmental scanning initiatives, firms can source and enter into contracts with suppliers to secure and guarantee continuous supply of raw materials and reducing lead time when proper strategies are mirrored and accurate forecast. Proper documentation cushion manufacturing firms from two types off risks; recurrent and disruptive risks.

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Table 9: Research Sample Size

S/No.	Location	No of Firms	No of Respondents
1.	Athi River	7	7
2.	Eldoret	7	7
3.	Kakamega	3	3
4.	Kericho	3	3
5.	Kisumu	10	10
6.	Meru	4	4
7.	Mombasa	35	35
8.	Murang'a	4	4
9.	Nairobi	132	132
10.	Naivasha	3	3
11.	Nakuru	8	8
12.	Nyeri	3	3
13.	Ruiru	6	6
14.	Thika	22	22
15.	Other towns	23	23
	Total	**270**	**270**

Source: Research Data (KAM 2022)

Table 10: Case Processing Summary

Valid Active Cases	**259**
Active Cases of with Missing Values	0
Supplementary Cases	11
Total	**270**
Cases Used in Analysis	**259**

Table 11: Food and Beverage Company Type

Company Type/ Food & Beverage Sector					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Edible oils	5	1.93	1.93	1.93
	Salt	9	3.47	3.47	5.40
	Baked Products & other Processed Cereals	68	26.25	26.25	31.65
	Food Snacks	40	15.44	15.44	47.09
	Diary & Dairy Products	54	20.85	20.85	67.94
	Meat and Fish Products	32	12.36	12.36	80.30
	Alcoholic Beverages	22	8.49	8.49	88.79
	Non- Alcoholic Beverages	29	11.21	11.21	100
	Total	**259**	**100.0**	**100.0**	

Source: Research Data (2023)