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Inventory Visibility and Performance of Large Food and Beverage Manufacturing Firms in Kenya

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Abstract

This study aimed to examine the impact of inventory visibility on the performance of large food and beverage manufacturing firms in Kenya. The research grounded the network perspective theory and employed a cross-sectional design. The target population comprised 561 individuals from 187 large-scale food and beverage manufacturing firms in Kenya, with human resource managers as the primary respondents, given their role as custodians of employee records. Using stratified random sampling, a sample of 228 respondents was selected. Data was collected through a structured questionnaire and pilot-tested on 10% of the sample to verify its validity and reliability before full deployment. Data analysis involved both descriptive and inferential statistical methods. The findings indicated that inventory visibility had not been effectively integrated into most firms surveyed. Furthermore, a strong and significant correlation was identified between inventory visibility and the performance of food and beverage manufacturing firms in Kenya. The study concluded that the lack of effective integration of inventory visibility contributed to inefficient inventory management, adversely affecting organizational performance. Accordingly, it is recommended that manufacturing firms enhance their supply chain processes by improving inventory visibility, allowing for more effective tracking of inventory flows to support improved performance outcomes.

Keywords: Inventory Visibility, Supply Chain Visibility, Firm Performance, Food and Beverage Manufacturing Firms

A. INTRODUCTION

Inventory visibility is a crucial factor in modern supply chain management, associated with reducing inventory levels and associated costs such as storage, handling, and waste while boosting profitability through interest savings (Singh, 2015). This principle has gained significant traction in the current competitive landscape, with advocates arguing that surplus inventory disrupts cash flow and imposes financial burdens on firms (Somapa, Cools, & Dullaert, 2018; McConaghy et al., 2017). Holding inventory incurs both capital and physical costs, prompting the development of strategies to address surplus or insufficient inventory levels. Notable strategies include Just-In-Time (JIT) and Material Requirements Planning (MRP) systems, with JIT focusing on waste reduction throughout the supply chain, contributing significantly to enhanced visibility (Sabry, 2015). Essential components of inventory visibility include collaboration with suppliers and customers, optimized machine setup times, reliance on proximate single-source suppliers, and establishment of preventive maintenance systems (Musa, Gunasekaran & Yusuf, 2014). As an inventory strategy, visibility aims to enhance return on investment (ROI) by reducing inventory levels and other related costs, ultimately impacting product quality and organizational efficiency (Li et al., 2018).

Inventory visibility centres on aligning stakeholder expectations regarding inventory levels and establishing robust tracking mechanisms to support organizational performance. Effective visibility requires collaboration throughout the supply chain and seamless data sharing, which is fundamental to strong supply chain relationships (Caridi et al., 2014). Studies have shown that such collaboration, particularly through comprehensive data exchange, enhances productivity, customer service, inventory management, risk management, and market performance. However, achieving internal visibility can be challenging due to legacy systems and the functional silos typical in many organizations (Holcomb et al., 2011). Holding excess or idle inventory is one of the primary inefficiencies in manufacturing; this inefficiency is often compounded by firms' inability to forecast demand and plan inventory flow, thereby increasing holding costs (Somapa, Cools & Dullaert, 2018). Thus, manufacturers benefit from sophisticated monitoring systems to manage inventory so that only short-term needs are met. Without clear inventory monitoring protocols, as (Musau et al., 2017) highlighted, firms face difficulties in reducing

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holding costs, adversely affecting overall performance. Furthermore, (Pundir et al., 2019) emphasize that inventory visibility enables firms to forecast demand accurately, facilitating informed decisions on inventory quantities and stock management.

Inventory tracking and advance notice are integral to effective inventory visibility. Tracking gives organizations insights into stock levels and when items will remain in storage, thus promoting cost-efficient inventory management (Sunmola & Apeji, 2020). Advance notice systems allow firms to anticipate inventory movement, enhancing warehouse planning and management. (Pundir et al., 2019) argue that tracking and advance notices strengthen supply chain operations, allowing them to contribute positively to performance. Logistical efficiency is crucial in the food and beverage industry, which produces and distributes consumable goods. This industry encompasses various activities, from research and development to ingredient sourcing, processing, and marketing (Sink & Langley, 2012). Recent data from the OECD (2022) show that while the quality of logistics services in Eastern Africa is average, several factors, including logistics costs, delivery time, truck turnaround time, complexity, and customer perception, impact efficiency.

Kenya's economic landscape has historically been agriculture-driven, with manufacturing recognized as essential to its development agenda. The food and beverage sector constitutes a significant portion of Kenya's manufacturing industry, with 197 firms representing 21.92% of the Kenya Association of Manufacturers (KAM) membership (KAM, 2019). As one of Kenya's primary industrial sub-sectors, manufacturing contributes around 70% of the sector's GDP, according to the Kenya Institute for Public Policy Research and Analysis (2013). Given the unique challenges posed by perishability and market volatility in the food and beverage sector, competitive strategies such as efficiency, cost management, flexibility, and responsiveness have become central to performance improvement (Tracey & Tan, 2010). Kenya's manufacturing sector has faced a declining trend in recent years, calling for comprehensive strategies that address financial and operational facets and supply chain dynamics. Food and beverage manufacturers face unique challenges within the sector due to product perishability and market volatility, with performance metrics from the Kenya National Bureau of Statistics indicating a decline in sector performance. These trends highlight the need to understand the factors contributing to this decline, particularly as some companies within the industry continue to grow profitably while others face mounting challenges. Inventory visibility is increasingly viewed as a key determinant of operational efficiency and organizational success, enabling firms to monitor inventory levels, reduce operational costs, and enhance customer satisfaction (Apeji & Sunmola, 2022). (Mutwiri et al., 2019) also highlight that inventory visibility improves inventory quality and reduces holding costs. However, existing studies have focused on varied contexts, and research specific to the Kenyan food and beverage manufacturing sector remains limited. This study aims to fill this gap by investigating the impact of inventory visibility on the performance of large food and beverage manufacturing firms in Kenya, seeking to offer insights into strategies that could enhance firm performance within this critical sector.

Theoretical Review

The theoretical foundation of this study is based on network theory, as proposed by Wellman (1988). This theory emphasizes the importance of structured, efficient networks between firms to strengthen competitive advantages and meet evolving market demands (Galaskiewicz, 2011). (McNichols and Brennan, 2006) argue that network theory encompasses dyadic (two-party) and multi-party relationships. Initially developed between the 1970s and 1980s, the theory explored alliances between entities, eventually evolving to address multi-level interactions across diverse actors within the supply chain (Wellenbrock, 2013). Chang, Chiang, and Pai (2012) highlight that a supply chain network is a complex model defined by the interdependent relationships among its participants (Hakansson & Ford, 2002). The network perspective has proven valuable in studying global supply chains and more localized industry-specific supply networks (Peck, 2005; Zhao, Anand & Mitchell, 2005).

(Hearnshaw and Wilson, 2013) argue that supply chains can be modelled as nodes representing autonomous firms capable of making independent decisions and interconnected relationships facilitating product and service creation. These linkages represent various exchange relationships, including contractual agreements and flows of information, materials, and finances. Network theory is a descriptive supply chain management (SCM) model within this framework, mapping the actors, resources, and activities involved. Emphasis is placed on long-term, trust-based relationships within supply chains, addressing issues such as buyer-supplier dynamics, third-party logistics, and the roles of actors within supply networks (Gunasekaran et al., 2008). Manufacturers increasingly form quasi-organizational networks with logistics service providers to meet customer expectations better and enhance satisfaction, integrating suppliers and distributors to meet market demands (Lu et al., 2018).

This theoretical framework supports examining logistics visibility's impact on the performance of Kenya's large food and beverage manufacturing firms.

In various studies, inventory visibility as a management practice has positively affected firm performance. For instance, (Gattorna, 2016) found that high-performing firms consistently implement comprehensive inventory visibility, contributing to reduced waste through strategies like preventive maintenance, minimized setup times, and levelled workloads. These practices correlate with improved profitability relative to competitors who lack similar levels of inventory visibility. In lean production, inventory is viewed as a potential source of waste to be minimized, aligning inventory visibility with efficient inventory management and higher quality standards. The work of (Durach et al., 2019) offers further insights into inventory visibility's role within supply chains and its impact on firm performance. They demonstrated that inventory visibility significantly enhances organizational performance but cautioned that overall firm performance cannot solely be assessed by inventory performance. Their study used return on assets (ROA) to measure firm performance and annual percentage changes in inventory turnover to assess inventory management. Results indicated a nuanced relationship: while some turnover improvements correlated positively with ROA, others had adverse effects, varying across firms due to differing performance baselines and turnover strategies.

(Apeji and Sunmola, 2022) investigated supply chain visibility (SCV) and its role in enhancing supply chain processes and firm performance, identifying inventory visibility as a critical component. They emphasize that firms should prioritize identifying processes most influenced by visibility, particularly regarding information flows (Titze & Barger, 2015). Extensive literature suggests visibility benefits procurement, manufacturing, planning, inventory management, and transportation processes. However, this study does not seek to catalogue all processes impacted by SCV but instead focuses on examining key processes integral to the company's structure and how they benefit from SCV implementation.

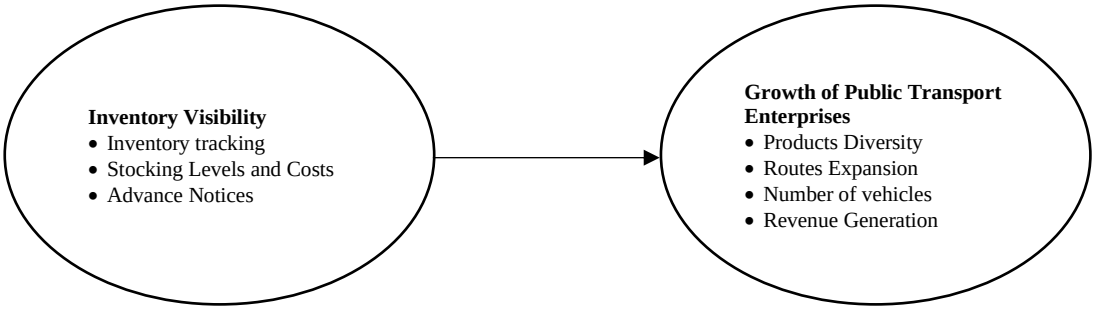

Figure 1. Conceptual Framework

B. RESEARCH METHODS

The research utilized a cross-sectional design, as outlined by (Saunders, 2019), which is particularly suited for establishing relationships between two or more variables by addressing essential research questions of "what," "when," "how," and "why." This design was selected due to its compatibility with regression modelling and correlation analysis, which is essential for hypothesis testing in this study. The target population consisted of 561 participants from Kenya's large food and beverage manufacturing firms, as documented by the Kenya Association of Manufacturers, which lists 187 large firms in this sector. The study targeted department heads in procurement, operations/production, and finance/accounting from each firm, focusing on these roles to gain a comprehensive view of inventory visibility across key functions within each organization.

A stratified random sampling technique was employed, categorizing respondents into strata by department—procurement, finance, and production/operations. Participants were randomly selected from each stratum. The sample size was calculated using (Kothari, 2014) formula for sample determination:

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2(N-1) + z^2 \cdot p \cdot q}$$

Where:
n = desired sample size
N = the total population (561)
e2 = acceptable error (the precision level at 0.05)
p = the proportion in the target population that assumes the sought characteristics. This study assumes a = 50:50 basis, with a probability of 50 per cent (0.5).
q = The balance from p to add up to 100 per cent. That is 1-P (1 - 0.5), which is 100 - 50 per cent (0.5) z2 = several standard deviation units of the sampling distribution corresponding to the desired confidence level of 95%, which is 1.96.

Thus, a sample of 228 respondents was selected, with participants randomly chosen from each departmental stratum.

$$n = \frac{(1.96 \times 1.96) \times (0.5 \times 0.5) \times 561}{(0.05 \times 0.05) \times 561 + (1.96 \times 1.96 \times 0.5 \times 0.5)}$$

n = 228

Primary data were collected using a questionnaire chosen for its impartiality, efficiency, and capacity to accommodate a large sample. The questionnaire was physically distributed using a drop-and-pick method, allowing respondents adequate time for completion. Once collected, all responses were reviewed to ascertain response rates. The study applied descriptive and inferential statistical techniques using SPSS version 27 for data analysis. Hypotheses were tested using a regression model, with significance determined at a 95% confidence interval (p-value < 0.05). This approach enabled analysis of the relationships between multiple independent variables and the dependent variable, facilitating robust conclusions about inventory visibility's impact on firm performance.

C. RESULTS AND DISCUSSION

Response Rate

In this study, 228 respondents were sampled from large food and beverage manufacturing firms in Kenya, with 205 questionnaires distributed. Of these, 183 questionnaires were returned fully completed, resulting in an 80.3% response rate and a 19.7% non-response rate. (Saunders, 2019) suggests that a response rate above 60% generally represents the sample population, indicating that the data obtained here were sufficient for a comprehensive analysis.

Descriptive Analysis of the Findings

The descriptive analysis explored how inventory visibility affects performance in Kenyan food and beverage manufacturing firms. Key aspects of inventory visibility examined included tracking inventory, issuing advance notices, and maintaining specific stocking levels. The findings, summarized in Table 1, show that most respondents indicated that their firms lack a structured framework for inventory tracking to control production, and inventory management is often not prioritized to maintain optimal levels. This aligns with the findings of (Kalaiarasan et al., 2022), who observed that firms with effective inventory tracking could better control inventory levels, thereby minimizing holding costs and avoiding shortages that could disrupt customer order fulfilment.

Additionally, (Kappel et al., 2020) highlight that ongoing stock-level management is essential in understanding what to retain in inventory, optimizing handling costs, and improving operational efficiency. (Leończuk, 2021) further underscores the importance of advance notices for inventory restocking to ensure timely replenishment and bolster customer satisfaction.

Table 1. Descriptive Statistics on Inventory Visibility

Statements	Mean	Std. Dev.
Our company has a framework for tracking its inventory as a way of controlling production	3.79	1.620
The management of our company's inventory has been upheld as a move to keep the inventory levels standard	3.67	1.249
The company has established stocking levels that guide production levels	3.87	1.544
The stocking costs are minimized to steer cost-saving in our organization	3.42	1.315
Our organization has an established standard stocking level that must be adhered to	3.83	1.482
There are allowed costs of stocking and inventory that should be upheld in our organization	3.81	1.588
Our organization provides early notices to notify the production section on when to produce and when not to	3.54	1.337

Statements	Mean	Std. Dev.
Our organization has an established framework for giving advance notices based on stocking levels and costs	3.43	1.678
The production process and timelines have been visible in our company to ease the supply chain planning process	3.57	1.237

Source: Research data, 2024

Correlation Analysis Results

A correlation analysis was conducted to determine the relationship between inventory visibility and the performance of large food and beverage manufacturing firms. As shown in Table 2, the Pearson correlation coefficient was 0.639, indicating a strong positive linear relationship between inventory visibility and firm performance. This finding aligns with the work of Moshood et al. (2021), who concluded that efficient inventory visibility ensures accurate tracking of inventory levels and timely demand forecasting, which are essential for prompt restocking. This, in turn, plays a crucial role in maintaining optimal inventory levels, helping firms meet customer orders without delays caused by inventory shortages.

Table 2: Correlation Analysis for Inventory Visibility and Performance of FBMFs

Variable		Performance of Large food and beverage manufacturing firms	Inventory visibility
Performance of Large food and beverage manufacturing firms	Pearson Correlation	1	.639*
	Sig. (2-tailed)		.000
	N	183	183
Inventory visibility	Pearson Correlation	.639**	1
	Sig. (2-tailed)	.000	
	N	183	183

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Source: Research data, 2024

Hypotheses Testing

The hypothesis was tested using a univariate regression model, as outlined below: Null Hypothesis (H_0): Inventory visibility has no significant influence on the performance of large food and beverage manufacturing firms in Kenya. The regression model is represented by:

$$Y = \beta_0 + \beta_1 X_1 + e$$

The model results provide insights into whether inventory visibility significantly impacts firm performance and support or refutes the null hypothesis.

Table 3: Model Summary of Inventory Visibility

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.639[a]	.599	.398	.73092

Source: Research data, 2024

The ANOVA results in Table 4 show that the F-statistic is 692.123, with a significance level (p-value) of less than 0.05. This finding indicates that the regression model is statistically significant and suitable for predicting the relationship between inventory visibility and the performance of large food and beverage manufacturing firms in Kenya. Therefore, we can conclude that inventory visibility significantly impacts firm performance, as the model provides a reliable basis for understanding this relationship.

Table 4: ANOVA of Inventory Visibility

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	111.616	1	111.616	692.123	.000[b]
	Residual	29.189	181	.161		
	Total	140.805	182			

a. Dependent Variable: Performance of Large food and beverage manufacturing firms
b. Predictors: (Constant), Inventory Visibility

Source: Research data, 2024

The results presented in Table 5 provide the regression coefficients and t-statistics derived from the model. The constant term,

β_0=0.802

β_0=0.802 indicates that if inventory visibility is held at zero, the baseline performance of large food and beverage manufacturing firms in Kenya would still be positive, at a value of 0.802. The regression coefficient for inventory visibility, β_1=0.767, is positive and statistically significant (p = 0.00 < 0.05) with a t-value of 26.308. This suggests that each unit increase in inventory visibility is associated with an expected increase of 0.767 in the performance of these firms. Thus, the results indicate a substantial positive effect of inventory visibility on firm performance, supporting the conclusion that enhancing inventory visibility can contribute meaningfully to improved performance outcomes in the sector.

Table 5: Coefficients of Inventory Visibility

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.802	.089		9.014	.000
	Inventory visibility	.767	.029	.890	26.308	.000

a. Dependent Variable: Performance of Large food and beverage manufacturing firms

Source: Research data, 2024

CONCLUSION

The study concludes that inventory visibility significantly impacts the performance of large food and beverage manufacturing firms in Kenya. The findings highlight that these firms benefit from robust communication channels among supply chain partners, enabling them to make informed decisions and respond efficiently to production demands and emergencies. By sharing high-quality information, companies achieve better coordination, enhancing service delivery and responsiveness. Notable IT and communication infrastructure advancements have further supported collaboration among supply chain participants. However, challenges remain in obtaining, assessing, and distributing quality information before, during, and after production processes, possibly due to the complexities of response systems in supply chains. Additionally, the study finds that large food and beverage firms often employ framework contracts, securing standby strategic suppliers to ensure emergency readiness. This visibility framework allows firms to incorporate partner input into essential attributes of products and services, enhancing operational resilience.

Moreover, the study underscores that effective manufacturing operations depend on collaborative efforts involving diverse supply chain actors such as donors, logistics providers, government agencies, and public opinion leaders. This diversity adds complexity, necessitating inventory visibility and coordinated actions to maintain efficient operations. However, findings indicate that there is often insufficient coordination and poor visibility in IT among manufacturing actors, which hinders collective decision-making. Effective coordination is essential, as lack thereof can exacerbate crises, leading to resource imbalances and potential neglect in certain areas. The study, therefore, highlights the importance of coordinated, visible inventory management to prevent operational inefficiencies and ensure equitable service delivery.

Recommendations

Based on the study's findings, it is recommended that large food and beverage manufacturing firms in Kenya enhance their use of information technology to integrate and standardize supply chain processes, ensuring transparency and coherence across internal activities. Effective inventory visibility depends on data availability, accuracy, timeliness, and the usability of information for all supply chain partners. Information sharing reduces uncertainty, minimizes the need for buffer stock, and promotes dynamic decision-making. Coordinated data exchange, particularly of advanced information, is critical for synchronizing activities across the supply chain. Improving IT visibility is essential, unifying resources and activities and promoting efficient operations.

To further strengthen inventory and supply chain visibility, it is recommended that firms adopt advanced technologies such as big data analytics, the Internet of Things (IoT), cloud computing, machine learning, artificial intelligence, social media, and blockchain. Big data analytics can help supply chains identify demand patterns, optimize inventory levels, and anticipate changes, supporting the development of products that meet customer needs effectively. By harnessing big data, firms can improve demand forecasts, address sourcing challenges, and lower operational costs. Additionally, emerging technologies like radio-frequency identification (RFID), sensors, GPS tags, chips, and barcodes can provide real-time inventory tracking, enhancing visibility across the supply chain and facilitating quick decision-making and collaboration.

Cloud computing enables real-time data exchange between supply chain applications and platforms, improving communication and order fulfilment. Cloud-based technology can bring significant benefits, such as

cost savings, enhanced visibility, improved forecasting, streamlined processes, and greater flexibility, ultimately supporting inventory visibility efforts. Blockchain technology also offers potential benefits for monitoring assets, tracking shipments, and providing accurate, real-time information on inventory locations and conditions. Blockchain can enhance inventory management accuracy by automating and improving just-in-time planning while reducing waste throughout the manufacturing supply chain.

Social media also presents an effective channel for gathering community feedback, allowing firms to address concerns and improve accountability. By facilitating rapid information exchange and empowering community engagement, social media enables beneficiary-driven decision-making, giving end-users a voice and fostering self-organization within supply chains. When integrated into supply chain strategies, these technological advancements offer transformative potential for Kenya's food and beverage manufacturing firms, enhancing their operational effectiveness, resilience, and responsiveness to market demands.

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