ISSN No:-2456-2165

Supply Chain Resilience and Performance of Sugar-Producing Firms in Kenya

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Abstract:- The sugar industry In Kenya plays an important role in bettering farmers' and citizens' living standards in the growing region and the general development of the country's economy. The sector continues to face endless supply chain risks and disruptions which consequently affect. Existing literature has hardly focused on the association between supply chain resilience and firm performance in the sugar sector. To bridge this gap, this research sought to examine the influence of knowledge management, contingency planning and supply chain visibility on the performance of sugar-producing firms in Kenya. The research was anchored on Resource Based View, Relational Views, Contingency and System theories. The research used a descriptive research design and targeted all 12 sugar-producing firms in the country. Primary data was collected using open and closed ended questionnaires. Data was analyzed descriptively and inferentially. The research's outcomes demonstrated that knowledge management, supply chain collaboration, contingency planning, and supply chain visibility all have significant effect on performance of sugar-producing firms in Kenya.

Keywords:- Supply Chain Resilience, Firm Performance.

I. INTRODUCTION

The sugar industry has been experiencing a disturbing trend in performance despite the spirited government and sector-wide strategies to revive the sector. Statistics reveals that nearly 50% of sugar firms in Kenya experience performance challenges. The continued poor performance of the sugar industry has seen Mumias and Soin stop their operations, and this has cumulatively resulted in a reduction in the country's GDP and an increase in unemployment levels (Sugar Directorate, 2019). The sugar industry experienced a drop of 41% in sugar produced in 2017 compared to the previous year, 2016 (Kenya Sugar Directorate, 2017). The trend was reversed in 2018 with an 18% increase in production, but the production dropped 2019 by 14% (Kenya Sugar Directorate., 2019). Poor performance has caused the sugar industry to fail to meet the current domestic demand of 850,000MT despite having the potential to produce over 1.09m tonnes of sugar (KAM)., 2021). To fulfill the excess demand, Kenya has had to import sugar from COMESA countries, which has resulted in an imbalance in trade (KNBS, 2017). The existing body of literature points to the presence of performance problems in the sugar industry in Kenya.

Indeed, numerous research studies have been done on the performance of Kenya's sugar sector and the various factors influencing it. For instance, Mbithi (2016) looked at how the performance of sugar firms is influenced by strategic choice. Onyango (2015) looked at how organizational capabilities can impact the performance of Kenyan sugar firms. Mbalwa, Kombo, Chepkoech and Koech (2014) looked at how performance of sugar companies is influenced by corporate governance while Nyangweso (2013) investigated how supply chain management influence the performance of sugar companies. None of these studies looked at how the sugar-producing firm's performance is affected by the supply chain resilience, thus creating a gap that the study has filled by looking at how supply chain resilience influences the performance of Kenyan sugar-producing firms. The findings of peripheral studies that were conducted on the connection between supply chain resilience and organizational performance of other Kenyan sectors, such as the pharmaceutical industry (Ochieng, 2018), supermarkets (Wakasala, 2020), and hospitals (Kariuki, 2018) raise a contextual and conceptual gaps and may not apply to the sugar industry as supply chain capabilities and vulnerabilities are different and unique in every sector (Waters 2008). There was, therefore, a need for research in the sugar industry. As a result, this investigation sought to find out the influence of supply chain resilience on performance of sugar-producing firms in Kenya.

II. OBJECTIVES

The general objective of the research was to establish the influence of supply chain resilience on the performance of sugar-producing firms in Kenya. Specifically, the research sought to examine the influence of knowledge management, supply chain collaboration, contingency planning and supply chain visibility on the performance of sugar-producing firms in Kenya.

- *Hypothesis*

H_{01}: Knowledge management has no statistically significant influence on the performance of sugar-producing firms in Kenya

H_{02}: Supply chain collaboration has no statistically significant influence on the performance of sugar-producing in Kenya.

H_{03}: Contingency planning has no statistically significant influence the performance of sugar-producing firms in Kenya.

H_{04}: Supply chain visibility has no statistically significant influence the performance of sugar-producing firms in Kenya.

III. RESEARCH DESIGN AND METHODOLOGY

The research study adopted a descriptive survey design. The design is suitable for observing collecting, describing, and documenting data on persons, organizations, practices, and developments the way they are without manipulating the data (Creswell & Creswell, 2017). The study targeted all sugar producing firms in Kenya. According to the Kenya sugar Directorate, there are 12 registered sugar producing firms in Kenya (Kenya Sugar Directorate, 2021). The study targeted 144 respondents from all 12 sugar-producing firms in the country. Questionnaires were employed in collecting primary data. The study analyzed the data descriptively and inferentially.

IV. RESULTS AND DISCUSSIONS

Simple linear and multiple regression models were used to test the strength between the variables. R-squared measured the goodness of fit, whereas ANOVA measured the dependability of the model. Coefficients helped in describing the nature and intensity of the relationship.

A. Influence of Knowledge Management on performance of sugar producing firms in Kenya.

The study's first hypothesis was that knowledge management has no statistically significant influence on the performance of sugar-producing firms in Kenya. The outcome are summarized in table 1

Table 1: Outcomes of knowledge management and performance of sugar producing firms in Kenya

a) Model summary

Model	R	R Square	Adjusted R square	Std. Error of the estimate
1	.631	.398	.392	.17487

a. Predictors: (constant), knowledge management;

b) ANOVA

Model		Sum of squares	Df	Mean square	F	Sig.
	Regression	2.061	1	2.061	67.386	.005
1	Residual	3.119	102	.031		
	Total	5.180	103			

c) COEFFICIENTS

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	2.145	.211		10.166	.000
	Knowledge	.438	.053	.631	8.269	.000

a. Dependent Variable: Performance

The study's outcome as displayed in table 1, indicated that the model had R and R squared values of 0.631 and 0.398, respectively. This means that knowledge management accounts for 39.8% of the variance in performance. Consequently, factors that were not considered in this study contribute to the remaining 60.2% variation in the performance. Subsequently, the research deduced that knowledge management significantly influences the performance. The ANOVA test yielded an F value of 67.386 and a significant value of 0.005< 0.05. This meant that the model was statistically significant, and knowledge management is an important predictor of performance in sugar-producing firms in Kenya. Coefficient results indicate that knowledge management had a beta and a P-value of 0.438 and 0.005. Unstandardized coefficients yield FP=2.145+0.4387KM+e, where 2.145 is the constant and K is the knowledge management index. This means that increasing knowledge management (KM) by one unit increases performance (FP) by 0.438. The null hypothesis was rejected with a significant-value of 0.05, establishing that knowledge management significantly influences the performance of sugar-producing firms.

The research's findings corresponded with those of Karani (2015), who concluded that knowledge management improves the level of service offered to customers, reduces operational costs, and informs decision-making. Chebii (2017) noted that knowledge management through knowledge acquisition, creation, and sharing influence return on equity. A study by Darroch (2015) reveals that a firm with knowledge management competency is more innovative and uses its resource more efficiently, thus realizing higher performance. Waki (2017) found that knowledge management improves the performance of firms through early identification and filling of gaps in supply chains and even using the knowledge gained from experience in handling emerging issues that threaten the performance and existence of the company.

B. Influence of Supply chain Collaboration on the performance of sugar-producing firms in Kenya

The study's second hypothesis was that supply chain collaboration has no statistically significant influence on the performance of sugar-producing firms in Kenya. Table 2 shows the results of a simple linear regression analysis.

Table 2: Supply chain collaboration and performance of sugar producing firms in Kenya

a) Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.523	.273	.266	.19212

a. Predictors: (constant), knowledge management;
Predictors: (constant), knowledge management

b) ANOVA

Model		Sum of squares	Df	Mean square	F	Sig.
1	Regressio	1.415	1	1.415	38.34	.008

ISSN No:-2456-2165

	n				3	
	Residual	3.765	102	.037		
	Total	5.180	103			

c) COEFFICIENTS

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	1.607	.205		7.836	.000
	Collaboration	.317	.051	.523	6.157	.000

The study's outcome as displayed table 2, indicated that the model had R and R squared values of 0.523 and 0.273. This means that supply chain collaboration accounts for 27.3% of the performance. As a result, other factors not addressed in this study account for the remaining 72.7% of performance variation.

The outcome of ANOVA indicated that the model had an F and P-values of 38.343 and 0.008. The results meant that SCC had significantly influences performance of sugar-producing companies. The results indicated that SCC was an important predictor of performance in sugar-producing firms. Coefficient results showed that SCC had a beta value of 0.317 and t-values of 12.734 and 6.192 with a P-value of 0.008. Unstandardized coefficients yield FP=1.607+0.317SCC+e, where 1.607 is the constant and SCC is the supply chain collaboration index. The findings imply that increasing supply chain collaboration (SCC) by one unit increases performance (FP) by 0.317. Based on a significant value of 0.008 < 0.05, the study rejected the null hypothesis and concluded that SC collaboration has a statistically significant effect on the performance of Kenyan sugar-producing firms.

The study's outcomes were in agreement with that of Wike, and Ke (2020), who found that SSC through trust, sharing information, commitment, and joint decision-making leads to higher performance. Mwangi (2014) urged sugar companies to embrace trust, early supplier involvement, and information sharing in their operations, as these factors directly affect performance. The study was also concurred with the discoveries of Apopa (2018), who revealed that supplier collaboration through joint risk management and frequent information sharing improves the performance of firms. However, Alkasb, Khaled, Awad and Alhanatleh (2012) discovered that supply chain collaboration through resource sharing and decision-making synchronization does not have any relationship with performance. Al-Doori (2019) found that information sharing and joint decision-making had positive and significant effects on performance, but electronic data interchange had insignificant effect on performance.

C. Influence of contingency planning on the performance of sugar-producing firms in Kenya.

The study's third hypothesis was that contingency planning has no statistically significant influence on the performance of sugar-producing firms in Kenya. Table 3 displays the outcome of a simple regression analysis.

Table 3: Contingency Planning and performance of sugar producing firms in Kenya

a) MODEL SUMMARY

R	R Square	Adjusted R Square	Std. Error of the Estimate
.562	.311	.309	.18640

a. Dependent Variable: Performance

b. Predictors: (Constant), contingency planning

b) ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.636	1	1.636	47.080	.000
	Residual	3.544	102	.035		
	Total	5.180	103			

c) **COEFFICIENTS**

model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. error	Beta	t	
1	Constant	2.579	.189		13.650	.000
	Contingency	.335	.049	.562	6.837	.000

The study's findings as displayed in table 3 above indicated that the R and R squared values were 0.562 and 0.311, respectively. This means that contingency planning explains 31.1% of the performance variation. As a result, other factors not considered in this study contribute to the remaining 68.9% variation in the performance of Kenyan sugar-producing firms.

The ANOVA test yielded an F and P values of 47.080 and 0.000 respectively (0.000< 0.05). The study showed that contingency planning was an important predictor of performance of sugar-producing firms. Hence, the research rejected null hypothesis, and it established that contingency planning significantly influences performance of sugar-producing firms in Kenya. Coefficient results indicated that contingency planning had a beta value of 0.335 and t-values of 13.640 and 6.861 with a P-value of 0.000. Unstandardized coefficients yield FP=2.579+0.3357CP+e, where 2.579 is the constant and CP is the contingency planning index. This means that increasing contingency planning (CP) by one unit increases performance (FP) by 0.335. Based on significant value of 0.000, null hypothesis was rejected and the study established that contingency planning positively and significantly influences the performance of sugar-producing firms in Kenya.

The study's outcomes agreed with those of Mugenda, Momanyi and Naibei (2012)), where it was concluded that contingency planning helps reduce risks, recover quickly, and even continue within operations during disruptions. Rodriques (2021)) asserted that contingency planning is critical in countering risks that had not been planned for in

ISSN No:-2456-2165

the initial formal planning. Holcomb and Ponomarov (2009) noted that contingency planning reduces supply chain vulnerability, thereby making a firm's operations flexible and, subsequently, better performance. Silva and Francisco (2012) noted that contingency planning is a critical ingredient in risk management and the subsequent performance of companies. Contingency planning enables a firm to identify, prioritize, and safeguard assets and reduce risk exposure when a risk occurs.

D. Influence of Supply chain visibility on the performance of sugar-producing firms in Kenya

The study's fourth hypothesis was that supply chain visibility has no statistically significant influence on the performance of sugar-producing firms in Kenya. Table 4 displays the outcome of a simple linear regression analysis.

Table 4: Supply chain visibility and performance of sugar producing firms in Kenya

a) Model summary

Model	R	R-Squared	Adjusted R-squared	Std. error of the estimate
1	.481	.232	.224	.19751

a. Dependent Variable: performance
b. Predictors: (Constant), visibility

b) ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.201	1	1.201	30.778	.000
	Residual	3.979	102	.040		
	Total	5.180	103			

c) COEFFICIENTS

Model	Unstandardized coefficients		Standardized coefficients			Sig.
	B	Std. Error	Beta		T	
1	Constant	2.746	.204		13.461	.000
	Visibility	.287	.052	.0542	5.518	.000

The study's outcomes as displayed in table 4 above indicated that the R and R squared values were 0.481 and 0.232, respectively. This means that supply chain visibility accounts for 23.2% of the variation in the performance. Consequently, factors that were not considered in this study contribute to the remaining 76.8% variation in the performance.

The test of ANOVA yielded F and significant values of 30.778 and 0.05 respectively. The results showed that supply chain visibility was an important predictor of the performance of sugar-producing firms. Hence, the research the rejected the null hypothesis and deduced that supply chain visibility statistically influences performance of sugar-producing firms in Kenya. Coefficient results indicated that supply chain visibility had a beta value of 0.287 and t-values of 13.491 and 5.548 with a P-value of 0.000. Unstandardized coefficients FP=1.746+0.287SCV+e, where 1.778 is the constant and SCV is the supply chain visibility index. This means that increasing supply chain visibility (SCV) by one unit increases performance (FP) by 0.287. Based on significant value of 0.000, null hypothesis was rejected and the research established that supply chain visibility significantly influences the performance of sugar-producing firms in Kenya.

The findings assented with the findings of Feisel, Hohenstein , Giunipero and Hartmann (2015), who found that supply chain visibility improves organizational performance through informed decision-making, process management, and reduced cost. Moretto, Caridi, Tumino and Perego (2013) noted supply chain visibility increases the flexibility and visibility of all nodes in the supply chain, thus leading to fast reaction to any challenges in the supply chains resulting in reduced cost and improved quality of product and service offered. Studies by Barratt and Oke (2007) confirmed that supply chain visibility leads to competitive advantage by reducing risks in their supply chains, thus enabling firms to excel in their performance. Christopher and Peck (2004) noted that supply chain visibility helps managers in the early identification of variations in supply chains and responding to them in a timely manner. Flynn, Huo and Zhao (2010) noted that supply chain visibility enables sharing of right and timely information that improves customer service, reduced cost, and improved customer responsiveness.

E. Influence of supply chain resilience on the performance of sugar-producing firms in Kenya

Multiple regression analysis was used to investigate the overall effect of supply chain resilience on the performance of sugar-producing firms. The outcome are summarized in table 5.

Table 5: Outcome of supply chain resilience and performance

a) MODEL SUMMARY

Model	R	R-Square	Adjusted R-squared	Std. error of the estimate
1	.715	.511	.492	.15987

a. Dependent Variable: Performance
b. Predictors: (Constant), Knowledge Management, Supply Chain Collaboration, Contingency Planning, Supply Chain Visibility

b) ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2.649	4	.662	25.914	.014
	Residual	2.530	99	.026		

ISSN No:-2456-2165

	Total	5.180	103			

C) COEFFICIENTS

Model		Unstandardized coefficients				Sig.
		B	Std. error	Beta	T	
1	(Constant)	1.705	.215		7.929	.000
	Knowledge Management	.346	.086	.498	4.045	.000
	Supply Chain Collaboration	-.015	.090	-.025	-.167	.007
	Supply Chain Visibility	.003	.076	.006	.045	.009
	Contingency Planning	.220	.046	.369	4.781	.000

The results displayed in the table 5 above indicated that knowledge management, SSC, contingency planning, and supply chain visibility greatly influenced the performance of sugar-producing firms with R-value of 0.715. The R Square value of 0.511 indicated that knowledge management, SC collaboration, contingency planning, and SC visibility together account for 51.1% of the variation in performance of Kenyan sugar-producing firms, while factors not covered in this study account for the remaining 48.9%.

The ANOVA test yielded F and P values of 30.778 and 0.014 respectively. The outcome showed that supply chain resilience is an important predictor of the performance of sugar-producing firms. Coefficient results indicated that supply chain resilience had beta and t-values as knowledge management (b-0.346, t-4.045), supply chain collaboration (b-0.15, t-0.167), contingency planning (b-0.220, 0.045, and supply chain visibility (b-0.003, t-6.781). Unstandardized coefficients FP=1.705+0.346KM-0.015SCC+0.003CP+0.220SCV where KM was knowledge management, SCC was supply chain collaboration, CP was contingency planning, and SCV was supply chain visibility. The null hypothesis was rejected with a significant value of 0.014< 0.05, and the study established that supply chain resilience has a statistically significant bearing on the performance of Kenyan sugar producing firms.

The outcomes were consistent with those of Wakasala (2020), who discovered that implementing supply chain resilience enhances firm's success. The study discovered that supply chain resilience affects firm's profit, responsiveness, and reliability. The findings were also supported by Ochieng (2018) and Mohammed and Mohammad (2022) whose studies concluded that resilience enables firms to stay informed and prepared to counter any disruption occurring in their supply chains and environment of operations, as well as take timely corrective actions to contain the situation in the event of risks. It was also discovered that knowledge management and supply chain visibility were the major performance influencers. The study also agreed with Koesgey (2021) findings that supply chain resilience is critical in creating and sustaining firm competitiveness.

Table 6: Summary of the Hypothesis

Hypothesis	Rule	P-value	Decision	Conclusion
$H0_1$. Knowledge management has no statistically significant influence on the performance of sugar-producing firms in Kenya.	When P< 0.05, null hypothesis is rejected	0.005	Reject $H0_1$	Knowledge management has statistically significant influence on the performance of sugar-producing firms in Kenya
$H0_2$. Supply chain visibility has no statistically significant influence on the performance of sugar-producing firms in Kenya.	When P< 0.05, null hypothesis is rejected	0.008	Reject $H0_2$	Supply chain collaboration has statistically significant influence on the performance of sugar-producing firms in Kenya
$H0_3$. Contingency planning has no statistically significant influence on the performance of sugar-producing firms in Kenya.	When P< 0.05, null hypothesis is rejected	0.000	Reject $H0_3$	Contingency planning has statistically significant influence on the performance of sugar-producing firms in Kenya
$H0_4$. Supply Chain Visibility has no statistically significant influence on the performance of sugar-producing firms in Kenya.	When P< 0.05, null hypothesis is rejected	0.000	Reject $H0_4$	Supply chain visibility has statistically significant influence on the performance of sugar-producing firms in Kenya

V. CONCLUSIONS OF THE STUDY

The study's primary goal was to establish the influence of supply chain resilience and its specific elements on performance of sugar-producing-producing firms in Kenya. Conclusions were drawn centered on the findings of the analyzed data and are discussed further below. According to the findings, Knowledge management is an essential component of supply chain resilience and has a significant impact on the overall performance of sugar-producing firms. Firms that can create, share, and apply acquired knowledge in their day-to-day operations are more likely to succeed. The training was also highlighted as a fundamental ingredient of firm success. Furthermore, the research established that SC

collaboration is an important element of supply chain resilience. Collaborative forecasting, sharing sales information, providing both technical and financial support to suppliers to improve their ability to meet firm requirements, and allowing free communication among supply chain participants are among key strategies for increasing supply chain collaboration and, as a result improving the success of sugar-producing firms in Kenya.

On contingency planning, the research concluded that mobilizing financial and non-financial resources in times of disruptions allows the firm to continue operations, resulting in improved performance. In addition, allocating adequate budgets and restructuring internal operations are critical in mitigating supply chain risks. The study also concluded that embracing real and accurate information sharing with other supply chain participants, adopting and utilizing technology, and mapping the supply network makes detecting risks in their supply chains simple. Lastly, the study concluded that supply chain resilience influences the performance of sugar-producing firms.

VI. IMPLICATION OF THE STUDY IN PRACTICE THEORY AND POLICIES

Sugar-producing firms form an important sugar sector with significant economic, political, and social implications. The study's findings improve the success of sugar-producing firms by establishing policies and practices that transform the sector into a more efficient and cost-effective one. The findings also help the management of these sugar-producing companies make informed decisions, which is especially important given the current volatile market. Supply chain resilience accounts for 51.1% of variation in sugar-producing firms in Kenya, making it an essential element of performance. With a 51.1% influence, it meant that there were other factors influencing the performance of Kenyan sugar-producing firms. This paves the way for future discussions and studies on the other factors that influence performance. The research also adds to the already existing pool of knowledge on the resilience and performance of the Kenya's sugar sector. The study strengthens the applicability and value of resource-based, relational view, system, and contingency planning theories in explaining the association between supply chain resilience and performance. When developing study variables, the theories can also serve as guiding principles for future investigations.

VII. RECOMMENDATION OF THE STUDY

The study revealed that all sugar-producing firms had invested in research and development, though partially. Given the numerous advantages, the study recommends that sugar-producing companies consider fully implementing the practice. The study also recommends that training of employees should be regular to improve their awareness and skills in managing emerging issues in the working environment. The study further recommends that sugar-producing firms should put in place strategies to facilitate learning from past experiences so that they are not affected by the same risks when they reoccur or if the risks are new, the firm will be better prepared in dealing with them.

The study recommends that sugar-producing firms should carry out collaborative forecasting with their key partners in order to exchange planning information that will inform their next move. The study further recommends that firms should embrace free communication among all supply chain participants. This will keep them informed of what is happening and what is expected of them in managing the supply chain risks in their area of operation.

On contingency planning, the study recommends that sugar-producing firms should allocate efficient budgets to risk management departments to enable them to counter the risks. The firms should also have backup suppliers for the critical spare parts so that the operations do not stop in case one supplier is unable to deliver the required item on time. The study also recommends that sugar firms should form emergency response teams in the event of disruptions to help in the quick recovery of the firms' operations. Finally, the study recommended that firms should ensure all their property/assets are insured so that in case of risks, the insurance companies can stand in for them and help them continue with their operations.

The study's findings also revealed that supply chain visibility positively and significantly influences the performance of sugar-producing firms. Even though the research had established that majority of firms had embraced information technology systems in their operations, a small percentage had not fully adopted information technology. It is therefore recommended that all sugar-producing firms fully adopt information technology in order to foster good performance. The research also suggests that sugar-producing firms implement effective business intelligence gathering programs in order to be equipped with critical information on risks before they occur. Finally, the study recommended that sugar-producing firms should map their supply chains to help monitor everything happening within the supply chain.

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