ROLE OF SUPPLY CHAIN RISK MANAGEMENT ON OPERATIONAL PERFORMANCE OF MANUFACTURING FIRMS IN NAIROBI CITY COUNTY, KENYA

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ABSTRACT

Supply chain risk management has become a critical focus for manufacturing firms facing increasing disruptions that threaten operational performance. In an increasingly volatile global market, supply chain disruptions have become a persistent challenge for manufacturing firms, particularly in developing economies. Geopolitical conflicts, economic uncertainties, logistical bottlenecks, and infrastructural inefficiencies have significantly impacted the supply chain networks for manufacturers, leading to increased operational costs, production delays, and decreased competitiveness. This study examines the role of supply chain risk management on the operational performance of manufacturing firms in Nairobi County, Kenya. Risk management strategies, including risk identification, assessment, mitigation planning, contingency sourcing, and proactive monitoring, were assessed for their influence on operational performance. This study employed a descriptive research design. Data were collected using structured questionnaires administered to 240 manufacturing firms. The gathered data were then analyzed using the Statistical Package for Social Sciences (SPSS), and Pearson correlation analysis revealed a strong, positive relationship between effective supply chain risk management and the operational performance of these firms. The findings underscore the importance of fostering risk awareness, agility, and technological integration within supply chains to optimize responsiveness and reduce vulnerability to disruptions. The study recommends that manufacturing firms strengthen their risk management capabilities to enhance operational performance, improve competitiveness, and ensure supply chain continuity. These insights provide valuable guidance for industry leaders, policymakers, and researchers seeking to develop resilient supply chain frameworks.

Keywords: *Supply chain risk management, supply chain disruptions, supply chain networks, Operational Performance of manufacturing firm.*

1.0 INTRODUCTION

In an era characterized by increasing global competition, supply chain disruptions, and rapidly changing market dynamics, supply chain risk management has emerged as a critical strategy for enhancing firm operational performance. SCRM involves the identification, assessment, and mitigation of risks across the entire supply chain, ensuring continuity and resilience in the face of uncertainty Anozie, Adewumi, Obafunsho, Toromade, & Olaluwoye, (2024).This strategic approach fosters proactive preparedness, agility, and robustness, enabling firms to anticipate, absorb, and recover from disruptions while maintaining operational efficiency.

Risk management practices in supply chains can take various forms, including risk identification and mapping, contingency planning, supplier risk assessments, and the integration of advanced technologies such as predictive analytics. These practices enhance supply chain visibility, minimize vulnerabilities, and improve responsiveness to market fluctuations. Research indicates that firms that embed comprehensive risk management strategies within their supply chains experience fewer operational interruptions and are better positioned to maintain consistent performance under stress (Bag, Dhamija, & Papageorgiou, 2024). For instance, proactive risk assessments and supplier vetting

processes can prevent delays, quality issues, or capacity constraints, thereby enhancing efficiency and customer satisfaction Patil, (2024). One of the foundational pillars of SCRM is real-time information sharing, which improves the coordination of risk mitigation activities across the supply chain. Transparent communication and timely data flow allow firms to forecast disruptions more accurately, implement contingency measures swiftly, and reduce the chances of stock-outs, overstocking, or production halts (Ghosh & Abotaleb, 2024). Moreover, the establishment of aligned risk mitigation incentives ensures that all supply chain partners prioritize stability and long-term reliability (Cao & Tao, 2025).

Despite its significance, supply chain risk management is not without challenges. Limited visibility across global supply chains, poor integration of risk data, and overreliance on a single supplier or geography are common vulnerabilities (Holloway, 2025). Additionally, insufficient investment in digital infrastructure and analytical tools can hamper a firm's ability to predict and respond to emerging risks (Huang et al., 2023). Overcoming these barriers requires firms to adopt a holistic risk culture, foster inter-organizational collaboration on risk mitigation, and deploy technologies that support predictive and adaptive decision-making.

Given the growing impact of unpredictable disruptions on manufacturing operations, this study sought to explore the role of supply chain risk management on the operational performance of manufacturing firms. By analyzing key dimensions such as risk identification, risk sharing, contingency planning, information transparency, and technological integration, this research aims to offer insights into best practices that can safeguard supply chain continuity and enhance long-term competitiveness.

1.1 Statement of the Problem

In today's highly interconnected and volatile global market, supply chain disruptions have become increasingly rampant, posing significant challenges for manufacturing firms (Mishra, Gupta, & Jha, 2024). These disruptions stem from a range of factors, including geopolitical conflicts, economic uncertainties, natural calamities, logistical bottlenecks, and infrastructural inefficiencies. The impact of such disruptions has been particularly severe in developing economies like Kenya (Yu, Razzaq, Rehman, Shah, Jameel, & Mor, (2021), where supply chain vulnerabilities have led to increased operational costs, prolonged production downtimes, and even business closures. While some firms have struggled to withstand these shocks leading to shutdowns and reduced industrial output others have managed to remain resilient and sustain their operations, raising critical questions about the strategies that enable firms to navigate disruptions successfully.

One of the key yet underexplored strategies for enhancing firms' operational performance is supply chain risk management systematic identification, assessment, and mitigation of risks within supply chain networks. According to Rehman, (2024) effective risk management enables firms to anticipate, prepare for, and respond to disruptions through proactive planning and strategic response mechanisms. SCRM fosters resilience, agility, and continuity by promoting the use of contingency planning, supplier diversification, scenario analysis, and real-time monitoring tools. Qudrat-Ullah (2025) research suggests that firms that implement robust risk management practices are better equipped to reduce lead times, minimize losses, and maintain operational flow during crises, ultimately enhancing their performance and competitiveness. However, in the Kenyan manufacturing sector, risk management remains a challenge due to fragmented supply chains, limited awareness of risk mitigation strategies, and inadequate technological infrastructure (Achoki, 2024). As a result, many firms remain vulnerable to disruptions, which affect their ability to adapt and thrive in dynamic market conditions.

This study, therefore, sought to investigate whether supply chain risk management strategies can enhance the operational performance of manufacturing firms in Nairobi County, Kenya. By examining key risk management practices such as risk identification, risk assessment, risk sharing, risk mitigation, risk monitoring and contingency planning, the research aims to provide actionable insights into how firms can build adaptive and responsive supply chains.

1.2 General Objective of the Study

To investigate the role of supply chain risk management on operational performance of manufacturing firms in Nairobi County, Kenya.

1.2.2 Research Hypothesis

H_{01} supply chain risk management does not have a statistically significant role on operational performance of manufacturing firms in Nairobi County, Kenya.

2.0 THEORETICAL REVIEW

2.1 Normal Accident Theory (NAT) High Reliability Theory (HRT)

These two organizational theories address accidents of all kinds in every aspect of organizational functioning. According to the NAT theory, accidents are inevitable sincediverse levels of complexity are present in organizations (Perrow, 1984; Shrivastava *et al.,* 2009). According to the NAT, every incident at the lowest level will eventually set off chain reactions at higher levels, which will result in an accident. According to (Perrow, 1994), complex interconnections and tightly connected systems within the organizations are to blamefor the occurrence of accidents. As a result, NAT emphasizes how intricately structured organizational structures are. According to NAT, in order to handle the intricate relationships and closely knit structure of organizational systems, capacity must be built. Organizational scientists from the University of California, Berkely, and, by extension, (Weick *et al.*, 1999; Shrivastava *et al.*, 2009) proposed the High Reliability Organizations (HRO) theory.

The goal of the HRO is to determine why certain businesses operate in extremely dangerous environments and with highly dangerous technologies while committing very few mistakes and accidents. The HRO theory was further advanced by Weick, Kathleen, and Obstfeld (2005) as cited by (Enya, Pillay & Dempsey, 2018). They proposed the idea of collective mindfulness, which identifies five traits of HROs: difference to expertise, commitment to resilience, sensitivity to operations, and preoccupation with failure (Hales, Satya, 2016; Weick, Kathleen, & Obstfeld, 2008 as cited by Enya *et al.,* 2018).

Scholars that challenge this theory contend that HRO disputes NAT (Sagan, 1993; La Pote, 1994). NAT asserts that accidents in intricately interconnected systems are unavoidable, contrary to HRO theory, which suggests that effective organizational design can help prevent accidents. Furthermore, NAT emphasizes that safety is not emphasized in the organizational objectives and that redundancy does not always decrease safety, contrary to HRO theory, which maintains that safety is a highly valued organizational aim and that redundancy promotes safety. HRO goes on to say that a culture of reliability-making and decentralized decision-making improve reaction to disturbances. On the other hand, NAT's understandingof a "tightly coupled" system appears to be lacking. The study's core focus is resilience, whichNAT and HRT support. A complicated network of businesses collaborating to deliver goods and services to a client is called a supply chain. Due to its complexity and frequent opposing goals, this network exposes the SCs to a variety of disruptions that spread from one organization to another. However, supply chains build up their dynamic capabilities so that they can withstand or overcome disruptions, adjust to them, and, in the event that they are unable to adapt, recover from the disruption by returning to normalcy while maintaining a respectable standard of customer service.

The Normal Accident Theory (NAT**)** argues that accidents are inevitable in organizations with complex, tightly coupled systems. Small incidents at lower levels can cascade into significant disruptions at higher levels due to these interdependencies. NAT emphasizes the importance of understanding system complexity and building capacity to handle interconnectedness and vulnerabilities (Sagan, 1993). In contrast, the High Reliability Organizations (HRO) theory, focuses on organizations operating in high-risk environments that manage to maintain minimal errors. HRO identifies key traits like collective mindfulness, commitment to resilience, sensitivity to operations, deference to expertise, and preoccupation with failure as critical to achieving high reliability. Unlike NAT, HRO contends that effective organizational design, a culture of reliability, and decentralized decision-making can prevent accidents even in complex systems.

While NAT asserts that accidents are unavoidable in complex systems, HRO emphasizes proactive measures and organizational practices to prevent and mitigate disruptions. Both theories highlight the importance of risk management but differ in their approach to achieving it. Supply chains, as complex and interconnected networks, are

prone to disruptions that can spread across organizations. NAT and HRO theories inform supply chain risk management strategies by addressing the dual aspects of understanding inherent vulnerabilities (NAT) and proactively creating systems to mitigate risks (HRO).

Supply chain risk management focuses on identifying potential risks, implementing redundancy, fostering decentralized decision-making, and cultivating a culture of awareness and preparedness. Aligning with HRO, supply chains can adopt proactive strategies such as scenario planning, regular audits, and decentralized leadership to manage disruptions effectively. From NAT's perspective, understanding the inevitability of disruptions reinforces the need for robust contingency planning, capacity building, and system-wide monitoring. Together, these approaches ensure that supply chains can withstand disruptions, adapt to challenges, and recover swiftly while maintaining operational continuity and customer service standards.

2.2 Empirical Review

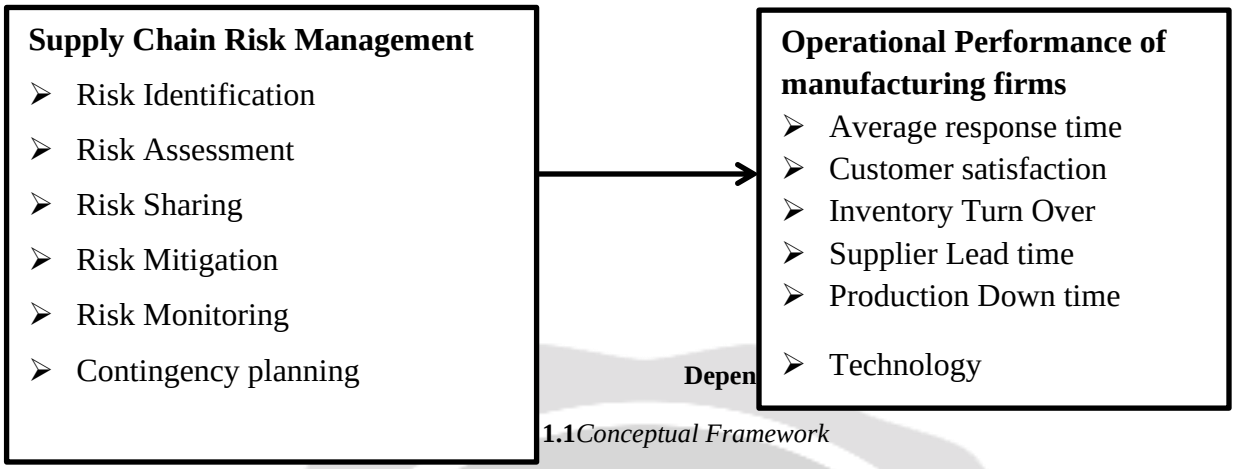
2.2.1 Supply Chain risk management on Operational Performance of Manufacturing Firms

Jjagwe and Okure (2024) attempted to empirically explore SCRes in poor countries and illustrate how this provides theoretical insights into the nature of what resilience is intended to be. Using a case study technique based on 45 interviews, a supply network of 20 manufacturing enterprises in Uganda was examined in order to address the following questions: What challenges do manufacturing firms in developing countries see as facing their supply chains? What methods do they use to strengthen their resilience? What results do these strategies produce when put into practice? What effects do these interrelated disruption threats and strategies have on SCRes? Their data demonstrated the intricate, interconnected, and nonlinear linkages that existed between the disruption risks, resilience strategies, and outcomes. The study also shows that the political, cultural, and territorial integration of the supply network of a developing nation could account for these relationships. Moreover, the phenomena of supply chain risk migration are impacted by this embeddedness. This is the process through which a threat is mitigated by generating a new hazard or by shifting the threat to a different part of the supply network. According to the study's findings, resilience should address both larger-scale, rare catastrophic catastrophes and smaller-scale, persistent problems.

Karani, (2022) study used a correlational survey approach and the Resource Based View framework to ascertain the effect of supply chain strategies on the performance of large-scale manufacturing firms in Kenya. The study's target population consisted of 473 officers from manufacturing companies in Nairobi; a sample of 403 was obtained by randomly selecting 70 officers to participate in an initial survey. Performance was found to be significantly impacted by supply chain risk management (F=2.956, =0.027, p0.05). The results support the theory that, in order to increase overall company operational performance, organizations should acknowledge the necessity for supply chain risk management measures.

Gachuhi (2023) assessed the impact of supply chain risk management tactics on the supply chain performance of Kenyan enterprises that manufacture food and beverages. Techniques for managing supply chain risks include adaptability, collaboration in the supply chain, a plan for rationalizing the supply base, risk control, and risk avoidance. The study's objective was to ascertain whether supply chain risk management techniques affected the performance of Kenyan enterprises that produce food and drink. This study examined supply chain risk management techniques used in the food and beverage industry in Kenya. Every Kenyan company that produces food and beverages was part of the target audience. A census survey method was used to identify 187 food and manufacturing enterprises from a KAM directory. A five-point Likert scale survey was distributed to senior managers with experience in supply- chain and logistics operations. Utilizing SPSS , both descriptive and inferential analysis was conducted to determine the impact of supply chain risk management techniques on the supply chain performance of Kenyan companies that manufacture food and beverages

2.3 Conceptual Framework



1.1*Conceptual Framework*

3.0 RESEARCH METHODOLOGY

The sampling technique employed by this study combined purposive sampling and proportionate stratified random sampling to ensure a representative selection of manufacturing firms. Purposive sampling was first used to select Nairobi County as the study location, given that Nairobi hosts the largest concentration of manufacturing firms in Kenya, making it an ideal setting for analyzing supply chain risk management. Additionally, purposive sampling was applied to identify manufacturing firms actively engaged in supply chain operations.

Thereafter, proportionate stratified random sampling was utilized to select respondents from a target population of 600 manufacturing firms, ensuring that different manufacturing sub sectors were adequately represented. A final sample size of 240 respondents was drawn from the different manufacturing firms' procurement departments, as these professionals play a critical role in supply chain risk management and operational decision-making.

To collect data, a structured questionnaire was administered, incorporating both closed-ended and open ended questions to capture both quantitative and qualitative insights. A pilot study was conducted in Thika County involving 24 manufacturing firms to test the reliability and validity of the research instruments. Thika County was chosen to avoid selecting the same respondents that participated in the pilot study, ensuring that the final study's sample remains independent and unbiased.

For data analysis, descriptive and inferential statistical techniques were applied using SPSS software. Descriptive statistics such as means and standard deviations were used to summarize the data, while inferential analysis was conducted to test the study's hypotheses. Multiple linear regression analysis was utilized to assess the relationship between the independent variable and the dependent variable. The regression model used in the study was expressed as follows: $Y=\beta 0+\beta 1X1+\varepsilon$, Where, Y = Operational performance of manufacturing firms, β_0 = Constant (intercept), β_1 = Regression coefficient, X_1 = Supply chain risk management, ε = Error term

4.0 RESULTS AND FINDINGS

4.1 Descriptive Statistics

4.1.1 Supply chain risk management.

The objective of the study was to examine the role of supply chain risk management on the operational performance of manufacturing firms in Nairobi County, Kenya. A 5-point Likert scale was used to measure the extent to which

respondents agreed with statements related to supply chain risk management and its role on operational performance. The scale ranged from 1 to 5, where 1 represented Not at all, 2 Small extent, 3 Medium extent, 4 Great extent, and 5 Very great extent. The responses were summarized using descriptive statistics, including mean and standard deviation, as shown in the table below.

Table 4.1: *Descriptive Statistics on Supply chain risk management*

Statements	Mean	Standard Deviation
The firm actively identifies potential risks in advance and prioritizes them for proactive response	4.19	1.40
The firm regularly evaluates identified risks based on their likelihood and potential impact on operations.	3.88	1.27
The firms risk management approach involves all stakeholders, including suppliers and partners, in identifying and addressing risks.	2.61	1.19
The firm has established mitigation strategies to minimize the impact of supply chain disruptions.	4.28	1.30
The firm continuously monitors its supply chain to detect and respond quickly to emerging risks	3.85	1.30
The firm has established contingency plans that ensure continuity of operations during unexpected disruptions.	2.95	1.29
Average	4.14	1.29

Table 4.1 The findings of this study highlight the critical role of supply chain risk management strategies in enhancing the operational performance of manufacturing firms. The high rating for risk identification (M = 4.19, SD = 1.40) underscores its importance in prioritizing potential risks, aligning with the work of Rehman, (2024). Who argue that effective risk identification helps firms anticipate and mitigate disruptions before they escalate, Furthermore, the moderate rating for involving all parties in risk identification (M = 3.88, SD = 1.27) supports the findings of Okoye, Falaiye, Ejairu, and Addy, (2024) emphasize that a collaborative approach to risk identification enhances supply chain robustness by leveraging diverse perspectives.

The highest-rated aspect of supply chain risk management risk mitigation strategies (M = 4.28, SD = 1.30) demonstrates that firms perceive proactive mitigation as an essential factor in minimizing disruptions. This finding aligns with the study by Yang, and Zhang, (2024) who asserts that risk mitigation through redundancy, flexibility, and diversification significantly enhances supply chain resilience. Additionally, the moderate rating for risk monitoring strategies (M = 3.85, SD = 1.30) supports the arguments of Dey, (2023), who suggest that continuous monitoring enables firms to respond swiftly to sudden demand fluctuations, thereby reducing potential disruptions.

The lower rating for risk assessment culture in reducing reaction time (M = 2.61, SD = 1.19) suggests that some firms struggle with proactive risk assessment. This aligns with the findings of Pavithra, (2024), who indicate that many firms focus more on reactive measures rather than fostering a predictive risk-aware culture. Similarly, the relatively low rating for a firm's ability to absorb the negative impacts of recurrent risks (M = 2.95, SD = 1.29) is consistent with the research by Musa, and Enggarsyah, (2024)., which found that firms with weak risk absorption capabilities tend to experience prolonged disruptions and reduced operational efficiency.

While the study confirms the importance of supply chain risk management strategies, the variation in standard deviations indicates diverse perspectives on their effectiveness. This variation is consistent with the findings of Piprani, Jaafar, Ali, Mubarik, & Shahbaz, (2022), who argue that while supply chain risk management contributes to

operational performance, its impact varies depending on firm size, industry characteristics, and the level of investment in supply chain risk management infrastructure. Additionally, the relatively low ratings in risk assessment culture and risk absorption suggest that some firms may lack the necessary supply chain risk management frameworks, as also noted by Egila, Kamal, Kumar Mangla, Rich & Tjahjono, (2025). Who emphasize that developing a proactive risk culture is a long-term process requiring organizational commitment.

The findings reinforce the argument that a strong supply chain risk management is essential for overall firm performance. This is in agreement with Can Saglam, Yildiz Çankaya, and Sezen, (2021) who found that effective supply chain risk management significantly enhances supply chain performance, thereby improving firm competitiveness. The study highlights the need for firms to invest in risk identification, mitigation, and monitoring while addressing weaknesses in proactive risk assessment and risk absorption capacity. Future research could explore specific barriers to risk assessment culture and the factors influencing firms' ability to absorb recurring risks.

Overall, these findings contribute to the growing body of knowledge on supply chain risk management affirming that supply chain risk management play a crucial role in sustaining long-term growth and enhancing competitiveness in manufacturing firms.

4.2. Operational Performance of Manufacturing Firms in Nairobi County, Kenya

The general objective of this study was to examine the role of supply chain risk management on the operational performance of manufacturing firms in Nairobi County, Kenya. The study utilized a five-point Likert scale to measure the extent to which respondents agreed with various statements regarding supply chain risk management. The scale was as follows: 1 represented Not at all, 2 Small extent, 3 Moderate extent, 4 Great extent, and 5 Very Great extent. The responses were summarized using descriptive statistics, including mean and standard deviation, as detailed in the table 4.2.

Table 4.2: *Descriptive Statistics on Operational Performance of Manufacturing Firms*

Statements	Mean	Standard Dev
1. The firm responds quickly to unexpected supply chain disruptions.	4.01	1.36
2. The firm consistently meets customer expectations even during challenging conditions.	3.83	1.35
3. The firm effectively manages inventory turnover through coordinated planning.	3.94	1.34
4. The firm experiences shorter supplier lead times through improved supply chain practices.	3.51	1.32
5. The firm minimizes production downtime through proactive operational strategies.	3.62	1.31
6. The firm utilizes technology to enhance responsiveness and coordination across the supply chain.	3.58	1.3
Average	3.74	1.33

The findings indicate that supply chain risk management plays a significant role in enhancing the performance of manufacturing firms, particularly in improving response time, inventory turn over, and customer satisfaction. The quicker response time to disruptions (M = 4.01, SD = 1.36) aligns with Matas et al. (2024), who argue that effective risk management enables firms to recover swiftly from supply chain disruptions. Similarly, Steen, Haug, and Patriarca (2024) highlight that firms with robust SCRM frameworks experience fewer operational setbacks and can maintain business continuity even during crises.

The improvement in customer satisfaction (M = 3.83, SD = 1.35) is consistent with Holloway (2025), who found that well-managed supply chain risks enhance service delivery, leading to increased customer trust and loyalty. Furthermore, Duong, Truong, Hoang, Pham, Hoang, & Truong Quang (2025) emphasize that proactive risk management contributes to consistent product availability and minimized service disruptions both key to sustaining customer satisfaction.

The role of SCRM in inventory turnover (M = 3.94, SD = 1.34) supports the findings of Liu, Costa, and Wu (2024), who suggest that managing supply chain risks effectively leads to better inventory turnover. However, the lower rating for reduced supplier lead time (M = 3.51, SD = 1.32) suggests inefficiencies still exist in optimizing responsiveness. This aligns with (Katsaliaki, Galetsi, & Kumar, 2022), who argue that while risk management improves efficiency, significant reductions in lead time require substantial investment in digital transformation and coordinated supply chain efforts.

The ability of SCRM to minimize production downtime (M = 3.62, SD = 1.31) demonstrates its importance in maintaining uninterrupted operations. This supports Steen et al. (2024), whose study found that firms implementing structured risk management frameworks are better prepared to mitigate disruptions and maintain production continuity. However, the moderate rating of technology adoption for supply chain optimization (M = 3.58, SD = 1.30) suggests that while firms recognize the value of digital solutions in managing risks, challenges such as cost, technical capability, and integration issues still hinder full implementation. This is in line with (Sutar, Kolte, and Yamini, 2025), who state that digitalization strengthens risk management but is often slowed by these barriers.

The overall mean score of 3.74 (SD = 1.33) reinforces the critical role of supply chain risk management in sustaining business continuity, operational efficiency, and customer service excellence. These findings are supported by Hamidu, Bello, Alhassan, & Moustafa, (2023). who established that risk management practices are vital for improving supply chain performance through risk mitigation and maintaining stable operations.

While the findings highlight significant benefits of SCRM, they also point to areas requiring improvement. Future efforts should focus on accelerating digital transformation to improve supply chain visibility and real-time risk response capabilities (Gupta et al., 2022). Moreover, investing in predictive analytics and artificial intelligence can enable firms to proactively identify and manage supply chain risks, thereby enhancing agility and responsiveness (Wong & Dwivedi, 2024).

By addressing these challenges, firms can fully leverage the benefits of supply chain risk management to achieve improved efficiency, competitiveness, and long-term sustainability in today's increasingly volatile market environment

4.3 Qualitative Analysis on Supply Risk Management.

The open-ended responses regarding supply chain risk management strategies indicated a strong awareness of the need for proactive risk identification, assessment, and mitigation across the organization. Respondents frequently mentioned the establishment of supply chain risk management committees, cross-functional risk teams, and the implementation of supply chain supply chain risk management software as key strategies. These committees, which included representatives from various departments such as finance, operations, and procurement, were tasked with identifying, evaluating, and prioritizing risks related to supply chain operations. This finding aligns with prior research by Holloway, (2024), who emphasized the importance of cross-functional teams in managing supply chain risks. By involving various departments, companies can achieve a holistic view of potential risks and enhance their capacity to respond effectively to disruptions.

Respondents also pointed out that supply chain risk management culture was embedded in the organization's day-to-day operations, with employees at all levels encouraged to report potential risks or vulnerabilities. This aligns with the work of (Singh, 2025), who argued that a risk-aware culture, where all employees are engaged in risk identification and mitigation, is essential for building resilient supply chains. By fostering an environment where supply chain risk management is a shared responsibility, firms are better positioned to detect and address emerging risks early on.

Another prominent strategy identified in the responses was the use of scenario planning and risk simulations to prepare for supply chain disruptions. Respondents mentioned that regular risk assessments, coupled with contingency planning, helped to mitigate the impact of unforeseen events such as raw material shortages or transportation delays.

These findings align with the work of Wolniak, (2024), who highlights the importance of scenario planning as a proactive tool in managing supply chain risks. By simulating potential disruptions, firms can develop more effective contingency plans, ensuring that they are better prepared for a variety of disruptions.

There was a strong focus on creating a culture of continuous improvement, where risk mitigation strategies were regularly reviewed and refined based on feedback from both internal and external stakeholders. This resonates with the continuous improvement principles discussed by Mishra, Gupta, and Jha, (2024), who emphasized that supply chains must evolve and adapt based on lessons learned from previous disruptions. The ongoing refinement of supply chain risk management strategies ensures that firms remain agile and can quickly adapt to new challenges as they arise.

The emphasis on training and raising awareness about supply chain risk management was also noted as an essential part of the organization's efforts to embed supply chain risk management practices throughout the workforce. This supports the findings of Mizrak, (2024) who suggests that supply chain risk management training is critical for enhancing employees' ability to identify, assess, and respond to risks effectively. By investing in employee education and raising awareness, organizations can foster a proactive supply chain risk management mind set, improving their overall resilience to disruptions.

4.4 Correlation Analysis

To examine the role of supply chain risk management on the operational performance of manufacturing firms, Pearson correlation coefficients were calculated. This analysis investigated the strength and direction of associations among supply chain risk management, Pearson's r values range from -1 to +1, with values closer to ±1 indicating stronger correlations. The significance level was set at 0.01 (two-tailed), meaning correlations are considered statistically significant if $p < .01$. The results are presented in the correlation matrix in the table 1.3.

Table 4.3*: Correlations Matrix Table*

		Supply Chain risk management	Operational Performance of Manufacturing Firm
Supply chain Risk management	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	235	
Operational Performance of Manufacturing firms	Pearson Correlation	.765	1
	Sig. (2-tailed)	<.001	
	N	235	235

The results indicate a strong positive correlation between Supply chain risk management and operational Performance of Manufacturing Firms ($r =. 765$, $p < .001$). This suggests that firms with strong supply chain risk management are more likely to experience improved operational performance. The correlation coefficient of 0.765 indicates a substantial positive relationship, meaning as supply chain risk management improves, so does the operational performance of manufacturing firms. The p-value (<.001) shows that this relationship is statistically significant, indicating that the observed correlation is unlikely to have occurred by chance.

4.5 Regression Analysis

4.5.1. The model summary

R-squared indicates the proportion of the variance in the dependent variable that is explained by the independent variable in a regression model. It measures the goodness of fit of the model to the observed data, indicating how well the model's predictions match the actual data points.

Table 4.4*: Model Summary for the role of supply chain risk management on operational Performance of Manufacturing Firms*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	**.765a**	**.585**	**.583**	**.523**

a. Predictors: (Constant), Supply chain risk management

The regression analysis for the role of supply chain risk management on operational performance of manufacturing firms yielded a coefficient of determination (R^2) of 0.585, indicating that 58.5% of the total variance in firm performance is explained by supply chain risk management. This suggests that supply chain risk management plays a crucial role in influencing manufacturing firm operational performance, reinforcing its importance in mitigating disruptions and enhancing operational efficiency. The remaining 41.5% of the variance in firm operational performance is attributable to other factors not included in the model.

The standard error of the estimate (SEE = 0.523) represents the average deviation of observed values from the predicted values. A lower standard error indicates that the model provides reasonably accurate predictions, further supporting its reliability in explaining the relationship between supply chain risk management strategy and firm performance in Nairobi County, Kenya.

Table 4.5*: ANOVA[a] for Supply chain risk management on operational Performance of Manufacturing Firms*

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	90.131	1	90.131	328.752	<.001[b]
	Residual	63.87	233	.274		
	Total	154.01	234			

a. Dependent Variable: Operational Performance of Manufacturing Firms
b. Predictors: (Constant),Supply chain risk management

The ANOVA results for the regression analysis of the role of supply chain risk management on the operational performance of manufacturing firms indicate that the model is statistically significant ($F = 328.752$, $p < .001$). The regression sum of squares (81.850) represents the proportion of the variance in firm performance explained by supply chain risk management, while the residual sum of squares (90.131) accounts for the unexplained variance. The high F-value and the significance level ($p < .001$) confirm that supply chain risk management is a significant predictor of firm operational performance in Nairobi County, Kenya. This result highlights the critical role of supply chain risk management practices in driving organizational success.

4.5.2. Regression Analysis

The regression analysis was conducted to evaluate the role of supply chain risk management on operational performance of manufacturing firms in Nairobi County, Kenya. Regression analysis is a statistical approach that models the strength and direction of relationships between a dependent variable and one independent. This analysis provides insights into how variations in supply chain risk management influence firm operational performance, enabling the identification of key factors driving organizational success.

Table 4.6 *Coefficients for Supply chain risk management on operational Performance of Manufacturing Firms*

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	2.146	.142		15.113	0.000
	Supply chain risk management	.741	.112	.765	6.616	0.000

a. Dependent Variable: Operational Performance of Manufacturing Firm

The regression analysis revealed a significant role of supply chain risk management and the operational performance of manufacturing firms. The regression equation derived from the results is:

$$Y = 2.146 + 0.741X_1$$

Where Y represents: Operational Performance of Manufacturing Firm and X_1 Supply chain risk management.

This indicates that for every one-unit increase in the supply chain risk management, the operational performance of manufacturing firms improves by 0.741 units, holding all other factors constant. The constant value (B = 2.146) represents the predicted level of firm performance when supply chain risk management is not applied.

The results further show that the unstandardized coefficient for supply chain risk management is statistically significant (t = 6.616, p < .001), confirming that supply chain risk management has a strong positive effect on the operational performance of manufacturing firms. Therefore, there is enough evidence to reject the null hypothesis and conclude that supply chain risk management does have a significant effect on the performance of manufacturing firms. The standardized coefficient (Beta = 0.765) highlights the strong role of this variable, indicating that supply chain risk management is a critical determinant of firm operational performance.

Hypothesis test

H0₁: Supply chain risk management does not have a statistically significant role on operational performance of manufacturing firms in Kenya

Table 4.7: *Summary of the Hypothesis testing results*

Hypothesis	Hypothesis Statement	I.V	β	S.E	t-value	p-value	R^2	Decision
H01	Supply chain risk management does not have a significant role on the operational performance of manufacturing firms in Nairobi County, Kenya.	Supply chain risk management	0.741	0.112	6.616	< 0.001	0.585	Rejected

Decision Criteria: Test significance at α = 0.05 (5% significance level). If the p-value (Sig.) is less than 0.05, we reject the null hypothesis (H_{01}). If the p-value is greater than 0.05, we fail to reject H_{01}. Results indicate that the p-value for Supply Chain Risk Management is <0.001, which is far less than 0.05, and the t-value (7.417) is large further confirming that supply chain risk management plays a significant role. Additionally, the Beta coefficient (0.765) indicates that supply chain risk management has a positive role on operational performance. Since the p-value is significant (<0.05), the study rejects the null hypothesis (H_{01}) and concludes that: Supply chain risk management has a statistically significant role in the performance of manufacturing firms in Kenya.

5.0 CONCLUSION AND RECCOMMENDATION

5.1 Conclusion

This study sought to investigate the role of supply chain risk management and its role on the operational performance of manufacturing firms in Nairobi County, Kenya. The findings underscore the critical importance of structured, proactive, and collaborative risk management practices in fostering resilience and improving firm performance in an increasingly uncertain and dynamic business environment.

The quantitative results revealed that supply chain risk management has a significant and positive impact on operational performance. The regression analysis confirmed that supply chain risk management explains a substantial portion of the variance in firm performance, indicating that firms that adopt effective risk management frameworks are better positioned to maintain operational continuity and respond to disruptions. As such, the null hypothesis, which stated that supply chain risk management has no significant effect on the operational performance of manufacturing firms, was rejected. The results validate that supply chain risk management is a vital predictor of operational success.

Correlation analysis further reinforced these findings. A strong positive correlation was observed between supply chain risk management and operational performance, suggesting that firms with mature risk management systems tend to perform better operationally.

The study also uncovered notable gaps in how supply chain risk management is perceived and implemented across firms. While risk identification and mitigation were viewed as important, there was limited agreement on the inclusivity of risk identification processes, suggesting that many firms may not involve all relevant internal and external stakeholders. Similarly, perceptions regarding the organizational risk assessment culture especially the ability to reduce reaction time to emerging risks were neutral, indicating potential weaknesses in embedding a risk-aware mindset within operational routines.

Despite moderate agreement on the existence of risk mitigation strategies and monitoring systems, concerns remained about the ability of firms to absorb and recover from large-scale disruptions. While efforts to minimize supply risk were acknowledged, variability in responses pointed to inconsistencies in the depth and effectiveness of current risk management practices.

Qualitative insights added further depth to the findings. Respondents emphasized the value of proactive strategies such as forming dedicated risk management committees, establishing cross-functional teams, and integrating risk planning into daily operations. Tools such as scenario planning, simulations, and contingency planning were highlighted as essential in managing uncertainty. Furthermore, the importance of training, feedback loops, and cultivating a culture of awareness and involvement were seen as necessary enablers for successful risk management implementation.

The study concludes that supply chain risk management plays a crucial and statistically significant role in enhancing the operational performance of manufacturing firms in Nairobi County. The evidence supports the adoption of comprehensive risk management strategies that are inclusive, proactive, and embedded into the organizational fabric. Institutionalizing such practices, supported by a culture of continuous improvement and stakeholder engagement, is essential in building resilient supply chains capable of withstanding and recovering from disruptions.

5.2 Recommendations

The study recommends that manufacturing firms in Nairobi County, Kenya, prioritize the institutionalization of robust supply chain risk management practices as a core component of their operational strategy. Specifically, organizations should cultivate an inclusive risk identification culture that actively engages personnel across various departments and levels. This approach ensures that a wide array of potential risks is detected early, enabling a more accurate and comprehensive risk profile, firms should focus on developing strong internal risk assessment protocols to reduce the lag between the identification of potential threats and the execution of response measures.

While most firms have some form of risk mitigation and monitoring system, the study reveals that many are inadequately prepared for large-scale or high-impact disruptions. As such, there is a need to reinforce these systems by investing in risk management capabilities such as shock absorption mechanisms, redundancy strategies, and adaptive planning. To further this agenda, firms should integrate supply chain risk management into everyday operational processes, rather than treating it as a one-off or reactive measure.

A culture of risk awareness must be nurtured through ongoing training, participatory risk simulations, and scenario planning exercises, allowing employees to develop the competencies needed to act swiftly and effectively during crises. Equally important is the establishment of feedback loops that allow organizations to continuously evaluate and refine their risk strategies based on real-time performance and evolving threats.

The government and relevant industry regulators should require manufacturing firms to maintain detailed risk management frameworks that are subject to regular external audits. They should also create and enforce national supply chain risk standards tailored to the manufacturing sector. Moreover, public-private partnerships with risk management experts should be promoted to facilitate knowledge transfer and access to advanced risk mitigation tools. To incentivize compliance, the government could offer grants, subsidies, or tax incentives to firms that invest in proactive risk assessment and contingency planning infrastructure. These combined efforts will contribute to a resilient manufacturing sector that can maintain stability in operational performance even in the face of unpredictable disruptions.

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