

## Supplier Risk Management Practices and Performance of Supply Chain in the Health Sector in Kenya

James Amere Owich<sup>1</sup>  
Dr. Jackline Akoth Odera<sup>2</sup>

<sup>1</sup>Jowich8@gmail.com  
<sup>2</sup>jacklineodero@gmail.com

<sup>1</sup><https://orcid.org/0000-0003-2604-1874>

<sup>2</sup><https://orcid.org/0000-0003-3220-5222>

<sup>1</sup>MBA Scholar, <sup>2</sup>Ph.D, Lecturer, Masinde Muliro University of Science and Technology, Kenya

### ABSTRACT

*Disruptions within the supply chain due to various risks can have significant and far-reaching consequences for businesses. To effectively address these risks, firms must develop robust strategies for risk management. The focal point of this study was the examination of supplier risk management practices and their influence on the performance of supply chains within the healthcare sector in Kenya. Employing a descriptive survey research design, the study targeted a pool of 102 respondents, ultimately drawing a sample of 81 staff members from four county referral hospitals in western Kenya. Data collection was carried out using closed-ended questionnaires, ensuring a methodically sound approach. To validate the research instrument, content validity was rigorously assessed, and the reliability of the instrument was established through the application of Cronbach's alpha test. Subsequently, the collected data underwent comprehensive analysis, utilizing descriptive statistics in the form of frequency and percentage calculations. Additionally, inferential analysis was conducted, employing a simple linear regression model to determine the relationship between supplier risk management practices and supply chain performance in the health sector. The study's findings revealed a substantial and positive correlation between supplier risk management practices and supply chain performance, as indicated by the coefficient results ( $\beta = 0.521$ ,  $t = 7.256$ ,  $p < 0.05$ ). Consequently, the null hypothesis was rejected, affirming that supplier risk management practices wield a considerable influence on the performance of the supply chain within the Kenyan health sector. These findings hold the potential to enhance our understanding of supplier management, offering valuable insights for managers within the health sector. Notably, the study emphasizes the crucial role that supplier risk management techniques like risk identification, risk assessment, and dual sourcing play in improving the performance of the supply chain. Furthermore, these findings may serve as a valuable resource for policymakers, offering essential information that can inform the formulation and revision of policies related to supply chain management within the healthcare sector.*

**Keywords:** Health Sector in Kenya, Supplier Risk Management Practices, Supply Chain Performance

### I. INTRODUCTION

In recent years, the forces of globalization have led to the expansion and dispersion of supply chains, presenting new challenges and risks to critical nodes within these intricate networks (Oguzhan & Erol, 2017). These supply chain risks necessitate the implementation of effective supplier risk management practices to mitigate potential negative outcomes associated with procurement activities (Masaku et al., 2018).

Supplier risk management is a crucial strategy employed to alter routines and controls, with the primary goal of eliminating or limiting the adverse consequences that may arise from purchasing processes (Masaku et al., 2018). It serves as a mechanism to reduce supplier risks to an acceptable level, recognizing that risks are unfavorable situations that can hinder an organization's ability to achieve its desired outcomes (Sotic & Ivetic, 2016).

Identifying these risks in the procurement process is the initial step towards efficient risk management (Shrestha et al., 2013). The spectrum of risks associated with purchasing goods and services is wide, encompassing issues such as reliance on a single provider, fluctuations in material costs, subpar product quality from suppliers, supply chain disruptions, currency fluctuations, supplier insolvency, legal and regulatory concerns, and unexpected costs, among others (Ahmad et al., 2019).

Moreover, factors affecting firm performance in supply chains extend beyond procurement risks, including environmental, technological, political, market, financial, organizational management, and contractor failure risks, as identified by Munyuko (2015) and Kamoni et al. (2018). These risks underscore the complexity of managing modern supply chains effectively.

To mitigate disruptions caused by these risks, many businesses informally adopt risk management practices, which typically include risk identification, risk assessment, risk mitigation, and ongoing risk monitoring within their supply chain operations (Simba et al., 2017). Integrating risk management into a firm's supply chain activities has been shown to enhance overall performance (Luisa, 2020), making it a critical consideration for contemporary supply chain management (Hallikas & Lintukangas, 2016; Wiengarten et al., 2016).

In this context, the focus shifts to the healthcare sector, a strategic area with significant implications for cost efficiencies and quality improvements (Kwon, Kim, & Martin, 2016). The African health sector, as highlighted by Akokuwebe and Adekanbi (2017), faces unique challenges, especially in countries grappling with poverty, like Kenya. Kenya, following the adoption of its 2010 constitution, decentralized healthcare services, aiming to ensure universal access to quality healthcare for all citizens (Wahome, 2019). However, this decentralization presented its own set of challenges, including inadequate supplier management, which led to a decline in the supply chain performance of public hospitals (Chemoiywo, 2018). These issues translated into difficulties in acquiring essential medical supplies.

Moreover, as mandated by the Constitution (2010), the expectation of quality healthcare remains a central concern for Kenyan counties (Achia & Mageto, 2015). However, many counties grapple with issues that impact health service delivery, including drug shortages, inadequate staffing, limited bed capacities, and insufficient resources for training management on supply chain strategies (Matheshe & Inimah, 2017; Okedi & Adungo, 2021). Specific instances, such as the underfunding of Vihiga County Hospital, further exacerbate the challenges, leading to reduced medical supplies and the deterioration of infrastructure and services (Transparency International, 2020). Consequently, county referral hospitals must devise effective strategies to address these pressing issues.

Given this backdrop, this study seeks to investigate whether supplier risk management practices can exert a positive influence on the performance of supply chains within the healthcare sector in Kenya. Prior empirical research on supply chain risks has been conducted in various contexts and sectors, ranging from Pakistan to Uganda and encompassing government agencies, the energy sector, and the manufacturing industry in Kenya. However, the unique structural and environmental dynamics of the healthcare sector in Kenya call for a specific examination of how supplier risk management practices impact supply chain performance in this critical domain.

### 1.1 Study Objective

To examine effect of supplier risk management practices on the performance of supply chain in the health sector in Kenya.

### 1.2 Study Hypothesis

H<sub>01</sub>: Supplier risk management practices do not significantly affect performance of supply chain in the health sector in Kenya.

## II. LITERATURE REVIEW

This section examines the literature by focusing on a theoretical, conceptual, and empirical review of the literature on supplier risk management practices and the performance of the supply chain.

### 2.1 Theoretical Framework

The study is anchored on game theory. Mathematician John von Neumann and economist Oskar Morgenstern laid the groundwork in the 1940s, and in the 1950s, many researchers and scholars expanded upon this work to further develop game theory (Vasnani et al., 2019). The three fundamental components of game theory are the players, the strategy space, and the reward functions (Agi et al., 2021). Each branch of game theory—non-cooperative and cooperative—focuses on a different type of interaction between players. In non-cooperative game theory models, players focus solely on advancing their own goals rather than considering how their actions could affect their opponents. However, cooperative game theory assumes that players can reach legally binding agreements. With the help of game theory, the leader-provider can investigate the repercussions of financial constraints on the distribution of inventory risk. Providers are incentivized to take all of the risks associated with having stock on hand when playing this game (Agi et al., 2021). The buyer or seller may fare better in a cooperative framework than in a non-cooperative one (Raj et al., 2018).

Although game theory has many applications, it has also received considerable criticism. It has been noted that game theory has its limitations when it comes to predicting realistic behavior. Any action, good or bad, can be rationalized if it furthers one's self-interest. A continuous difficulty in game theory modeling is identifying and then

defining, limiting, isolating, and/or accounting for any set of features and factors that affect strategy and outcome. Something unexpected always seems to be in play (Morgenstern, 2014).

Participants in this study's supply chain could be compared to players in a game with a common board, rules, and risks based on the fact that they share information, resources, channels of communication, and demands from customers, as well as logistical networks and common threats such as weather and natural disasters. The main goal of using game theory in supply chain risk management is to analyze potential disruptions and create countermeasures. Using game theory, businesses may prevent catastrophic events in their supply networks. Therefore, supplier risk management and SCP are appropriate areas of study for this theory.

## 2.2 Conceptual Review of Study Variables

### 2.2.1 Supplier Risk Management Practices

Supplier risk management entails actions such as identifying, assessing, and mitigating risks that are posed by suppliers. When supply market activity and the organization's interactions with suppliers lead to consequences that damage the firm's reputation, capability, operational integrity, or financial sustainability, the company is subject to supplier risk (Kamoni, Rotich, & Ochiri, 2018).

The goal of supplier risk management is to lessen exposure and guarantee continuity in the face of both routine and unforeseen threats to the supply chain, which are assessed and managed in real time. Such risks include product failure, disruption, regulatory risk, reputational risk, legal risk, supplier size, financial risk, and competitive risk (Oduma & Getuno, 2017). Other risks linked to suppliers include delivery schedules, prices, poor quality, and non-delivery (Ominde et al., 2022). Munyuko (2015) identified ways of controlling risks such as continuous risk management training, adopting framework contracts with regards to suppliers, having an efficient contract management system, comprehensive record-keeping, and insurance of supplies. Hosseini et al. (2019) contended that organizations that had a risk mitigation inventory and relied on multiple suppliers were able to cope with supply chain disruptions more effectively. Monitoring supply chain risk mitigates the negative effects of risks (Florian & Constangioara, 2014). In this study, risk identification, risk assessment, and dual sourcing were the indicators of supplier risk management.

### 2.2.2 Supply Chain Performance

Performance measures aid in understanding, managing, and improving what organizations do. Firm performance is linked to a firm's efficiency, evaluation, quality, profitability, effectiveness, growth, and competitiveness (Taouab & Issor, 2019; Saini & Singh, 2020). Supply chain performance entails meeting customers' expectations by ensuring products are available and are delivered on time (Weeks & Namusonge, 2016). Performance of the supply chain was measured by on-time delivery of goods and services, user satisfaction, cost savings, and quality of the goods and services.

## 2.3 Empirical Review

Javaid and Siddiqui (2018) studied the impact of supply chain risk management factors on the responsiveness and performance of Pakistani businesses' supply chains. The information was collected through a survey. According to the results of this study, there is a positive, statistically significant connection between supply risk management, operational risk management, supply chain responsiveness, and supply chain performance (SCP). Research conducted among Ugandan SMEs by Eyaa and Ntayi (2010) affirmed that the inclusion of risk-taking in purchasing, as a facet of procurement practices, exerted an influence on supply chain performance. Adequate risk identification as well as management are critical to enhancing a firm's performance in its supply chain due to changes in markets as a result of increased diversity (Mburu et al., 2015). Munyuko (2015) conducted research into the impact of supply chain risk management on business outcomes. Andy forwarders and logistics service employees made up the study's population. The questionnaire was the major instrument of data collection; however, interviews and other primary sources were also employed. The findings demonstrated a causal relationship between effective management of supply chain risks and enhanced organizational effectiveness. It was determined that supply chain risks have an impact on organizational performance and recommended that organizations be aware of the risks in their supply chains, assess those risks, and put contingency plans in place to deal with the ones that are most serious.

Okonjo et al. (2016) investigated the relationship between procurement risk management strategies and SCP among Kenyan mobile phone service providers. This research employed a descriptive approach. Using a questionnaire that was left for people to pick up when they were free, information was obtained. Findings revealed that procurement risk management practices influenced SCP. Mburu (2017) surveyed Kenyan manufacturers to assess their risk

management strategies and supply chain effectiveness. The research method used was a descriptive cross-sectional survey. The 412 Nairobi County manufacturing enterprises that are KAM members were the intended audience. The study found that when the constructs of a risk identification management plan were integrated, they had an effect on SCP. In addition, a systematic approach to risk appraisal and analysis was in place at the vast majority of these businesses.

Kamoni et al. (2018) aimed to analyze the effect of procurement risk management on the success of large-scale energy projects in Kenya. The research included a tally of all 47 megaprojects in the energy industry that were procured by the various public procuring agencies. Managers in charge of purchasing for organizations working on large-scale projects served as the study's units of analysis. Primary data was gathered with the help of questionnaires that were created in an unbiased manner. The research indicates that the procurement performance of major projects in Kenya's energy industry is greatly affected by procurement risk management. Inadequate information collection for contractor evaluation was also identified as a problem in the procurement processes of mega projects, which the report suggests could lead to the hiring of unqualified contractors. The study recommended the adoption of risk management tools, for instance, multiple sourcing, stakeholder management, feasibility studies, risk appraisals, and risk guarantees, which contribute to the management of procurement risks that include financial risks, the risk of contractor failure, land and way-loan acquisition risks, and technology risks.

Nyagechanga (2017) aimed to determine if and how procurement risk management techniques impact SCP for businesses. This study used a descriptive research strategy. 147 workers from across Kisii Bottlers Limited Company were selected as the study's participants. The information was gathered with the help of a questionnaire. The research indicated that the company's management should continue to undertake regular risk assessments in their supply chains to avoid the negative consequences of uncertainty. The study concluded that management should prioritize procurement risk management because of the growing recognition that threats can originate from previously unanticipated sources. Drawing from the findings, it can be concluded that procurement risk management techniques have an influence on supply chain performance (SCP). Apopa (2018) embarked on a study to investigate the effects of various supply chain management strategies on the operational outcomes of Kenyan government agencies. The researchers used a cross-sectional approach. Twenty federal ministries served as the unit of analysis, and all 1,372 people employed in supply chain management were included in the study. Questionnaires were used to gather first-hand information for the study. The study found that the performance of government ministries in Kenya was positively and significantly impacted by supplier selection methods, supply chain rules, supplier collaboration practices, and risk management approaches, with the latter being the most significant predictors.

Waithira (2018) analyzed the impact of supplier management on the productivity of Kenyan manufacturers. The study found that supplier evaluation and supply risk analysis had significant effects on productivity. Ochieng (2019) found that risk identification as well as hedging had a positive and significant effect on manufacturing firms' performance in Kenya. The study recommended that firms have better risk identification practices, such as continuous supplier capacity prescreening, inventory forecasting, and engaging in periodic procurement analysis.

### III.METHODOLOGY

The study employed a descriptive survey research design and focused on a sample of 102 personnel within the healthcare sector, specifically in county referral hospitals located in the western region of Kenya. Using Yamane (1973), a sample size of eighty-one was ascertained and stratified across four county referral hospitals in western Kenya. Data was collected using a closed-ended questionnaire that was divided into two parts, where Part I had questions on supplier risk management practices and Part II had questions on the performance of the supply chain. A Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree) was used. A pilot study was done whereby the questionnaire was administered to 8 respondents. The instrument's validity was tested using content validity, and reliability was tested using Cronbach's alpha test. The entire study variables coefficients were above 0.7 and thus were considered good. Data was analyzed both descriptively through the use of frequencies and percentages and inferentially through simple linear regression analysis. The regression model used is as follows:

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

Where;

Y= Supply chain Performance

$\beta_0$ = Constant

$X_1$ = Supplier risk management practices

$\beta_1$  = Regression co-efficient



$\epsilon$ =Error term

#### IV.RESULTS AND DISCUSSION

##### 4.1 Response Rate

Fifty nine questionnaires out the eighty one administered were returned yielding a response rate of 72.8% a response rate of 60% and above is deemed sufficient for data analysis (Creswell & Plano, 2011).

##### 4.2 Reliability

Cronbach’s alpha test was utilized to ascertain the instrument’s reliability. The instrument was found to be reliable for collecting data as the values were more than 0.7 (Sekaran & Bougie, 2013). The results are indicated in table 1.

**Table 1**  
*Reliability Test Results*

Variables	Cronbach Alpha	No. of Items
Supplier risk management practices	0.755	5
Supply chain performance	0.849	5

##### 4.3 Descriptive Analysis Results

##### 4.3.1 Descriptive statistics Results on Supplier Risk Management Practices

This section provides descriptive results for statements on supplier risk management practices.

**Table 2**  
*Descriptive Statistics: Supplier Risk Management Practices*

Statements	Stats	5	4	3	2	1
Potential supply chain risks are identified by the hospital.	f	10	30	6	5	8
	%	16.9	50.8	10.2	8.5	13.6
The hospital assesses level of supplier risk.	f	19	13	20	5	2
	%	32.2	22	33.9	8.5	3.4
The hospital regularly hosts training seminars in conjunction with our vendors.	f	16	21	15	4	3
	%	27.1	35.6	25.4	6.8	5.1
Joint risk workshops are held with the hospital and its vendors.	f	13	21	14	8	3
	%	22	35.6	23.7	13.6	5.1
To mitigate hazards, dual sourcing is ideal in any healthcare facility.	f	9	24	17	7	2
	%	15.3	40.7	28.8	11.9	3.4

Table 2 shows the respondents level of agreement in regards to statements on supplier risk management practices. The majority (50.8% were in agreement with the statement that the hospital is doing a good job of identifying supply chain risks. On the other hand, 13.6% of people indicated they strongly disagreed that the hospital does identify potential risks in the supply chain. Moreover, 32.2% and 22% of respondents strongly agreed and agreed, respectively, that the hospital assesses the level of supplier risk. As for the hospital holding joint training sessions with our suppliers, 35.7% of respondents agreed, 27.1% strongly agreed, and 25% agreed. The results also showed that 35.6% of respondents agreed with the statement that the hospital hosts collaborative risk workshops with our suppliers, while 22.0% strongly agreed and 23.7% agreed. 40.7% of respondents believed that dual sourcing was desirable to balance risks, with 15.3% strongly agreeing and 28.8% moderately agreeing. Findings from this study are consistent with those from a study by Nyagechanga (2017), who noted that businesses may lessen the impact of uncertainty on their operations by maintaining a consistent cycle of risk assessments across their supply chains. Findings by Munyoku (2015) revealed that 87% of the respondents were in agreement that the organization should have a formal risk identification process and engage in continuous training on risk management.

##### 4.3.2 Descriptive results on Supply Chain Performance

The descriptive results on supply chain performance are summarized in Table 3.



**Table 3**  
*Descriptive Statistics on Performance of supply Chain*

Statements	Stats	5	4	3	2	1
There is timely delivery of goods and services.	F	18	25	10	3	3
	%	30.5	42.4	16.9	5.1	5.1
User departments are pleased with the items and services acquired.	F	4	24	13	13	5
	%	6.8	40.7	22	22	8.5
Goods and services are acquired at the current market price.	F	16	23	8	9	3
	%	27.1	39	13.6	15.3	5.1
The appropriate quantity of items is acquired.	F	13	26	11	7	2
	%	22	44.1	18.6	11.9	3.4
The hospital acquires high quality goods and services.	F	18	25	10	3	3
	%	30.5	42.4	16.9	5.1	5.1

Table 3 shows that, overall, 30.5% of respondents agreed and 42.4% strongly agreed that there is timely delivery of goods and services. 40.7% agreed that user departments are pleased with the items and services acquired. 27.1% and 39% strongly agreed and agreed that goods and services are acquired at the current market price. 44% agreed that the appropriate quantity of items was acquired. Finally, 42.4% of respondents agreed that the hospital acquires high-quality goods and services. Thus, the majority were in agreement with the statements on the performance of the supply chain in the health sector. The findings concur with those of Ochieng (2019), who established that risk management practices influenced manufacturing firms' performance. Similarly, Mburu et al. (2015) asserted that adequate risk identification and risk management were inevitable as they enhanced the performance of supply chains in manufacturing firms. Javaids and Siddiqui (2018) found that supply chain risk management factors impacted Pakistani businesses' responsiveness and performance.

**4.4 Simple linear Regression Results on Influence of supplier risk management practices on performance of supply chain**

The hypothesis states that;

$H_{01}$ : *Supplier risk management practices do not significantly affect the performance of the supply chain in the health sector in Kenya.*

**Table 5**  
*Regression Results of Supplier Risk Management Practices and Performance of Supply Chain*

Model Summary									
"Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.505 <sup>a</sup>	.255	.250	.7347	.255	52.648	1	57	.000
a. Predictors: (Constant), supplier risk management practices									
ANOVA <sup>a</sup>									
Model	Sum of Squares		Df	Mean Square	F	Sig.			
1	Regression	28.420	1	28.420	52.648	.000 <sup>b</sup>			
	Residual	83.130	58	.540					
	Total	111.550	59						
a. Dependent Variable: performance of Supply chain									
b. Predictors: (Constant), supplier risk management practices									
Coefficients									
Model	Unstandardized Coefficients			Standardized Coefficients		t	Sig.		
	B	Std. Error		Beta					
1	(Constant)	1.490	.263			5.661	.000		
	Supplier risk management practices	.521	.072		.505	7.256	.000		
a. Dependent Variable: performance" of supply chain									

The correlation coefficient (R) of 0.505 indicated a substantial positive link between supplier risk management and supply chain performance. The supply chain performance in the health sector varied by 25.5% ( $R^2 = 0.255$ ), all due to the supplier's risk management practices.

The ANOVA test results indicate that the model proposed is significant and thus feasible for the study. ( $F=52.648$ ;  $p<.05$ ). According to the coefficient results, the link between supplier risk management practice and the performance of the supply chain is positive and significant ( $\beta = .521$ ,  $t = 7.256$ ,  $p = 0.000 < 0.05$ ). The null hypothesis is thus rejected, as supplier risk management practices do have a substantial impact on the performance of the supply chain in the Kenyan health sector. The results are represented in the following model:

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon \text{ becomes: } Y = 1.490 + 0.521 X_1 + \varepsilon$$

According to the results, supplier risk management had a beta coefficient of 0.521,  $P = 0.000$ . This means that a one percent increase in supplier risk management will result in a 52.1% increase in the performance of the supply chain, assuming all other factors remain constant. These findings corroborate those of Mburu (2017), who showed that supply chain performance was affected when risk identification and management approach constructs were applied jointly. Similarly, the study findings support assertions by Munyuko (2015), who confirmed the connection between effective supply chain risk management and overall business success and recommended that businesses be aware of the risks in their supply chain, assess them, and put contingency plans in place to deal with them. Javaid and Siddiqui (2018) indicated that supply risk management and operational risk management are positively and significantly related to supply chain responsiveness and that supply chain responsiveness is positively and significantly related to supply chain performance. Moreover, Hughes and Wadd (2012) reiterated that ineffective risk management can have a detrimental effect on the efficiency of the supply chain. Therefore, it is essential for a firm to methodically manage all of its interactions with its suppliers in order to practice good supplier relationship management.

## V. CONCLUSION & RECOMMENDATIONS

### 5.1 Conclusion

The study established that supplier risk management practices significantly impacted the performance of the supply chain in the health sector. This implies that identifying risks, conducting risk assessments, undertaking collaborative risk workshops with suppliers, and utilizing dual sourcing eliminate threats in the supply chain, thus bolstering performance. The study contributes to the literature in the area of supplier management by affirming that supplier risk management practices impact supply chain performance in the health sector in Kenya. Moreover, the findings may aid policymakers in developing policies related to supplier risk management. The management of county referral hospitals in the western region of Kenya can draw from the findings to understand the influence of supplier risk management practices and come up with better risk management strategies to help improve supply chain performance. The findings also contribute to the body of knowledge in the area of supplier risk management since they can be used as a reference point by future researchers and academicians.

### 5.2 Recommendations

Supply chain practitioners, including managers of county referral hospitals, should view supplier risk management practices as inevitable in procurement processes. The county referral hospitals should strategize to adopt supplier risk management practices to enhance supply chain performance in the health sector in Kenya. Specifically, supply chain managers in county referral hospitals (CRH) should proactively identify risks, and this should be a continuous process. The hospitals should have supply chain risk registers to record risks. Supply chain managers should continuously assess the level of risks to know the extent to which they affect performance. The CRH should conduct regular trainings on supplier risk management targeting supply chain staff as well as suppliers. CRH should encourage the development of a proactive and robust risk management culture so as to manage supply chain risk. CRH should practice dual sourcing as a way of mitigating risks that may arise. Lastly, the supply chain managers in CRH should have contingent plans in place so as to deal with supplier risks.

## REFERENCES

- Achia, T. N., & Mageto, L. E. (2015). Individual and contextual determinants of adequate maternal health care services in Kenya. *Women & Health*, 55(2), 203-226.
- Agi, M. A., Faramarzi-Oghani, S., & Hazır, Ö. (2021). Game theory-based models in green supply chain management: A review of the literature. *International Journal of Production Research*, 59(15), 4736-4755.

- Ahmad, S., Hadyait, M. A., & Rashid, M. M. (2019). Effect of Supply Chain Risk Management on Organization Performance: A Case Study of National Foods Manooabad Muridke District Sheikhpura. *Economic Review*, 1(01), 1-7.
- Akokuwebe, M. E., & Adekanbi, D. M. (2017). Corruption in the health sector and implications for service delivery in Oyo State public hospitals. *Ilorin Journal of Sociology*, 9(1), 200-217.
- Apopa, V. A. (2018). *Influence of supply chain management practices on performance of government ministries in Kenya* (PhD thesis, Jomo Kenyatta University of Agriculture and Technology, Kenya).
- Chemoiwo, P. K. (2018). *Public procurement procedures and supply chain performance in state corporations in Kenya* (PhD thesis, University of Nairobi, Kenya).
- Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd Ed.). Thousand Oaks, CA: Sage.
- Eyaa, S., & Ntayi, J. M. (2010). Procurement practices and supply chain performance of SMEs in Kampala. *Asian Journal of Business Management*, 2(4), 2-88.
- Florian, G. L., & Constangoara, A. (2014). The Impact of Risks in Supply Chain on Organizational Performances: Evidence from Romania. *Economia. Seria Management*, 17(2), 265-275.
- Hallikas, J., & Lintukangas, K. (2016). Purchasing and supply: An investigation of risk management performance. *International Journal of Production Economics*, 171, 487-494. <https://doi.org/10.1016/j.ijpe.2015.09.013>
- Hohenstein, N. O., Feisel, E., Hartmann, E., & Giunipero, L. (2015). Research on the phenomenon of supply chain resilience: A systematic review and paths for further investigation. *International Journal of Physical Distribution & Logistics*,
- Hosseini, S., Ivanov, D., & Dolgui, A. (2019). Review of quantitative methods for supply chain resilience analysis. *Transportation Research Part E-Logistics and Transportation Review*, 125, 285-305.
- Hughes, J., & Wadd, J. (2012). Getting the most out of SRM. *Supply Chain Management Review*, January/February, 22-29.
- Javaid, T., & Siddiqui, D. A. (2018). Supply Chain Responsiveness and Supply Chain Performance: The Role of Supply Chain Risk Management.
- Kamoni, P., Rotich, G., & Ochiri, G. (2018). Influence of Procurement risk management on procurement performance of mega projects in the energy sector in Kenya. *European Journal of Logistics, Purchasing and Supply Chain Management*, 6(5), 1-12.
- Kwon, I. W. G., Kim, S. H., & Martin, D. G. (2016). Healthcare supply chain management; strategic areas for quality and financial improvement. *Technol. Forecast. Soc. Chang.*, 113, 422-428.
- Luísa, P. (2020). "Green supply chain practices and company performance in Portuguese manufacturing sector." *Business Strategy and the Environment*, 29(5), 1832-1849.
- Masaku, E. N., Ogol, C., & Moronge, M. (2018). Role of integrated financial management information system (ifmis) on procurement performance in government ministries in Kenya: A Case of ministry of health. *The Strategic Journal of Business and Change Management*, 5(2), 1546 – 1566.
- Matheshe, J. O., & Inimah, G. (2017). Investigation of Crisis Prevalence in the Health Sector: A Case Study of Bungoma Referral Hospital. *International Journal of Science and Research (IJSR)*, 6(10).
- Mburu, D. K. (2015). An Assessment of Effect of Risk Identification Management Strategy on Supply Chain Performance in Manufacturing Companies in Kenya. *International Journal of Economics, Commerce and Management*, 3(4), 1-17.
- Mburu, D. K., Ngugi, P. K., & Ogollah, K. (2017). Risk Management Strategy and Supply Chain Performance among Manufacturing Companies in Kenya. *International Journal of Supply Chain and Logistics*, 1(1), 1-21.
- Morgenstern, O. (2014). On some criticisms of game theory. *Princeton University, Econometric Research Program*.
- Munyuko, C. W. (2015). Effects of supply chain risk management on organization performance: Case of Andy Forwarders Services Limited. *International Journal of Academic Research in Business and Social Sciences*, 5(3), 380. <http://dx.doi.org/10.6007/IJARBS/v5-i3/1527>
- Nyagechanga, E. H. (2017). An assessment of the effects of procurement risk management practices and supply chain performance: A case of Kisii bottlers limited. *Semantic Scholar*. <https://www.semanticscholar.org/author/Henry-Esther-Nyagechanga/1395302694>
- Ochieng, B. E. (2019). Effect of Supply Chain Risk Management Practices on Performance of Manufacturing Firms in Kenya. *Journal of International Business, Innovation and Strategic Management*, 2(1), 14-30.

- Oduma, E. O., & Getuno, P. (2017). Effects of procurement regulations on performance of public secondary schools in Nairobi City County, Kenya. *International Journal of Innovative Social Sciences and Humanities Research*, 5(3), 50–68.
- Oguzhan, K., & Erol, S. (2017). A proactive approach to supply chain risk management: Shifting orders among suppliers to mitigate the supply side risks. *Journal of Purchasing and Supply Management*, 23(1), 54–65.
- Okedi, W., & Adungo, F. (2021). Effectiveness of Hospital Management Committees in Busia County, Kenya. *Health*, 13, 1129–1144. <https://doi.org/10.4236/health.2021.1310084>.
- Okonjo, E., Magutu, P., & Nyaoga, R. (2016). Procurement risk management practices and supply chain performance among mobile phone service providers in Kenya. *Management Science Letters*, 6(2), 141–156.
- Ominde, S. O., Osoro, A., & Monari, D. G. (2022). Contractual Supply Chain Governance, Relational Supply Chain Governance and Performance of Agro Processing Firms in Kenya. *Strategic Journal of Business and Change Management*, 9(2), 585–602.
- Raj, A., Biswas, I., & Srivastava, S. K. (2018). Designing supply contracts for the sustainable supply chain using game theory. *Journal of Cleaner Production*, 185, 275–284.
- Republic of Kenya. (2019). *Delivery of Health Services, Report and Recommendations*. Nairobi: Government Printer.
- Saini, S., & Singh, D. (2020). Impact of implementing lean practices on firm performance: a study of Northern India SMEs. *International Journal of Lean Six Sigma*, 11(6), 1005–1034. <https://doi.org/10.1108/IJLSS-06-2019-0069>.
- Sekaran, U., & Bougie, R. (2013). *Research Methods for Business*.
- Shresthal, A., Chan T. K., Chan, Aibinu, A., & Chen, C. (2013). Risk Transfer in Public Private Partnerships; lessons from the water waste treatment sector. *Journal of Sustainable Development Law and Policy*, 2(1), 206–221.
- Simba, S., Theuns, K., Assilah, A., & Wesley, N. (2017). Supply chain risk management processes for resilience: A study of South African grocery manufacturers. *Journal of Transport and Supply Chain Management*, 11(1), 1–13.
- Sotic, A., & Ivetic, M. (2016). Public health risk analysis through evaluation of drinking water safety. *Vojnosanitetski Pregled*, 73(9), 885–887.
- Taouab, O., & Issor, Z. (2019). Firm performance: Definition and measurement models. *European Scientific Journal*, 15(1), 93-106.
- Transparency International. (2020). A Social Audit Report on Service Delivery in the Health Sector in Vihiga County, Kenya. *Transparency International*. Retrieved from <https://tikenya.org/wp-content/uploads/2020/10/Vihigasocial-Audit-Report.pdf>
- Vasnani, N. N., Chua, F. L. S., Ocampo, L. A., & Pacio, L. B. M. (2019). Game theory in supply chain management: Current trends and applications. *International Journal of Applied Decision Sciences*, 12(1), 56-97.
- Wahome, C. W. (2019). *Impact of Devolved Health on Maternal Healthcare in Kenya: The Case of Nyandarua County* (Doctoral dissertation, University of Nairobi).
- Waithira, A. (2018). Effect of supplier management practices on the performance of manufacturing firms in Kenya. *GSI*, 6(8), 669.
- Weeks, M. P., & Namusonge, G. S. (2016). Influence of information technology practices in procurement on procurement performance in public institutions in Kenya, a case of Jomo Kenyatta University of Agriculture and Technology. *International Journal of Economic, Commerce and Management*, 4(5), 484-502.
- Wiengarten, F., Humphreys, P., Gimenez, C., & McIvor, R. (2016). Risk, risk management practices, and the success of supply chain integration. *International Journal of Production Economics*, 171, 361–370. <https://doi.org/10.1016/j.ijpe.2015.03.020>
- Yamane, T. (1973). *Statistics: An Introductory Analysis* (3rd Ed.). Harper & Row Ltd.