

FIFTH PARTY LOGISTICS AND PERFORMANCE OF E-COMMERCE FIRMS IN NAIROBI CITY COUNTY, KENYA

Adrian Ogol.

Jomo Kenyatta University of Agriculture and Technology [JKUAT], Nairobi, Kenya.

Dr. Peter Gikonyo.

Jomo Kenyatta University of Agriculture and Technology [JKUAT], Nairobi, Kenya.

©2026

International Academic Journal of Procurement and Supply Chain Management (IAJPSCM) | ISSN 2518-2404

Received: 9th September 2026

Published: 15th October 2026

Full Length Research

Available Online at: https://iajournals.org/articles/iajpscm_v3_i3_84_98.pdf

Citation: Ogol, A., Gikonyo, P. (2026). Fifth party logistics and performance of e-commerce firms in Nairobi city county, Kenya. *International Academic Journal of Procurement and Supply Chain Management*, 3(3), 84-98.

ABSTRACT

The study examined the influence of fifth party logistics (5PL) on performance of e-commerce firms in Nairobi City County, Kenya. Fifth party logistics represents an advanced logistics model that leverages specialized software platforms to deliver comprehensive supply chain services. While 5PL offers significant benefits including cost savings, improved visibility and enhanced customer satisfaction, e-commerce firms in Nairobi continue to face challenges in order fulfilment and seamless delivery operations. Guided by Resource Based View (RBV), Transaction Cost Economies (TCE), and Just in Time (JIT) theories, the study adopted a descriptive research design targeting 180 heads of departments from 30 e-commerce firms. A sample of 102 respondents was obtained using Nassiuma's formula, with stratified random sampling employed to select respondents. Data was collected using structured questionnaires and analyzed using descriptive and inferential statistics via SPSS Version 30. The findings revealed

strong positive correlations between 5PL practices and firm performance. Distribution had the highest impact ($\beta=0.304$), followed by technology integration ($\beta=0.219$), lean logistics ($\beta=0.239$) and customized warehousing ($\beta=0.271$). Regression analysis indicated the four practices collectively accounted for 73.6% of performance variation ($R^2=0.736$). The study concludes that 5PL adoption is a key strategic approach for improving competitiveness and efficiency of e-commerce operations. Recommendations include greater investment in route optimization tools, automated warehousing systems, staff training on lean processes, and full-scale integration of logistics technologies.

Key words: Stakeholder Awareness, Financial Accountability, Ward Development Fund, Marsabit County, Devolved Governance

INTRODUCTION

The logistics industry has undergone remarkable transformation driven by shifting customer expectations, accelerated digitalization demands, evolving socioeconomic dynamics, and innovative technological advancements. From the early 2000s, organizations increasingly leveraged changes in logistics services. Hernandez (2022) classified logistics services into multiple tiers: First party logistics (1PL) involves private companies handling direct storage, transportation, delivery, and reception of goods. Second party logistics (2PL) manages both transportation and warehousing. Third party logistics (3PL) providers handle broader operations including order picking, inventory control, reverse logistics, and cross-docking. Fourth party logistics (4PL) offers consultancy services including planning, localization, management, and integration of new technologies without engaging in physical transportation.

Finally, Fifth party logistics (5PL) represents the most advanced logistics model, integrating advanced IT systems to ensure real-time visibility and control across all supply chain levels (Winqvist, 2023).

Online purchasing and e-commerce packaging, production and use have grown steadily in recent years. E-commerce refers to buying and selling goods and services online, where customers visit websites or marketplaces, make electronic payments, and merchants ship products or deliver services (Gull et al., 2023).

The Kenyan e-commerce industry leads other African countries, with the digital economy contributing 7.7% to GDP (UNCTAD, 2022). The Kenyan e-commerce market is projected to reach USD 793.70 million in 2024, driven by 86% internet penetration and 43.2% e-commerce adoption rate among 55.5 million people (Statista, 2023). The Communications Authority of Kenya (2023) found that 39% of private enterprises are involved in e-commerce. Despite this growth, e-commerce companies face logistical challenges including road infrastructure quality, warehousing network needs, inventory management, order fulfilment, technology limitations, and cost constraints (Kenya National E-Commerce Strategy, 2023).

Problem Statement

Despite the critical role of e-commerce in Kenya's economy, the industry faces significant challenges. Online trade platforms have traditionally not been regulated under the Kenya Information and Communications Act (KICA), limiting consumer protection (Communications Authority of Kenya, 2023). The Finance Act 2020 introduced a 1.5% digital service tax on gross transaction value from digital marketplaces. Beyond regulatory issues, e-commerce firms face logistical challenges that hinder optimal performance. The Kenya National E-Commerce Strategy (2023) identifies challenges including road infrastructure quality, warehousing network needs, inventory management, order fulfilment, technology limitations, and cost constraints. While 5PL has been studied in Western countries, there is a notable research gap in Kenya. This study aims to fill that gap by exploring 5PL opportunities and drawbacks in the Kenyan context and demonstrating its impact on e-commerce performance in Nairobi City County.

Objectives of the Study

General Objective: To assess the relationship between fifth party logistics and performance of e-commerce firms in Nairobi City County, Kenya.

Specific Objectives:

1. To examine the relationship between fifth-party distribution and performance of e-commerce firms in Nairobi City County.
2. To establish how fifth-party customized warehousing relates with performance of e-commerce firms in Nairobi City County.
3. To determine the relationship between fifth-party lean logistics and performance of e-commerce firms in Nairobi City County.

4. To evaluate the relationship between fifth-party technology integration and performance of e-commerce firms in Nairobi City County.

Scope of the Study

The study focused on e-commerce firms in Nairobi City County, Kenya. The scope involved firms and professionals within the e-commerce platform industry. The questionnaire was modeled and developed exclusively to serve the business interests of companies in the selected sector.

LITERATURE REVIEW

Theoretical Review

The study was anchored on three theoretical frameworks:

Resource Based View (RBV) Theory: This theory posits that a firm's ability to maintain competitiveness depends on its access to valuable, rare, inimitable, and non-substitutable resources (Kero & Bogale, 2023). Resources can be categorized into physical resources (buildings, machinery), financial resources (capital, debtors, creditors), human resources (skills, expertise, knowledge), and intellectual resources (patents, brands, business systems, customer databases).

Transaction Cost Economics (TCE) Theory: This theory explains when it is more efficient for transactions to occur across the market or within an organization (Nagle, Seamans & Tadelis, 2024). 5PL arrangements benefit e-commerce companies when transaction costs (contracting, monitoring, managing providers) are lower than maintaining in-house logistics functions.

Just in Time (JIT) Inventory Management Theory: Originating from the Toyota Production System, JIT's core principle is eliminating activities that do not add value to final products, effectively removing wasteful elements from production processes. 5PL providers excel at implementing JIT principles by optimizing inventory levels based on real-time demand data and efficient transportation management (Paksoy, Kochan & Ali, 2021).

Conceptual Framework

The conceptual framework links fifth party logistics services (Distribution, Customized Warehousing, Lean Logistics, Technology Integration) to firm performance indicators (Profitability, Customer Satisfaction, Competitive Advantage), offering a comprehensive view of how 5PL leads to better firm performance.

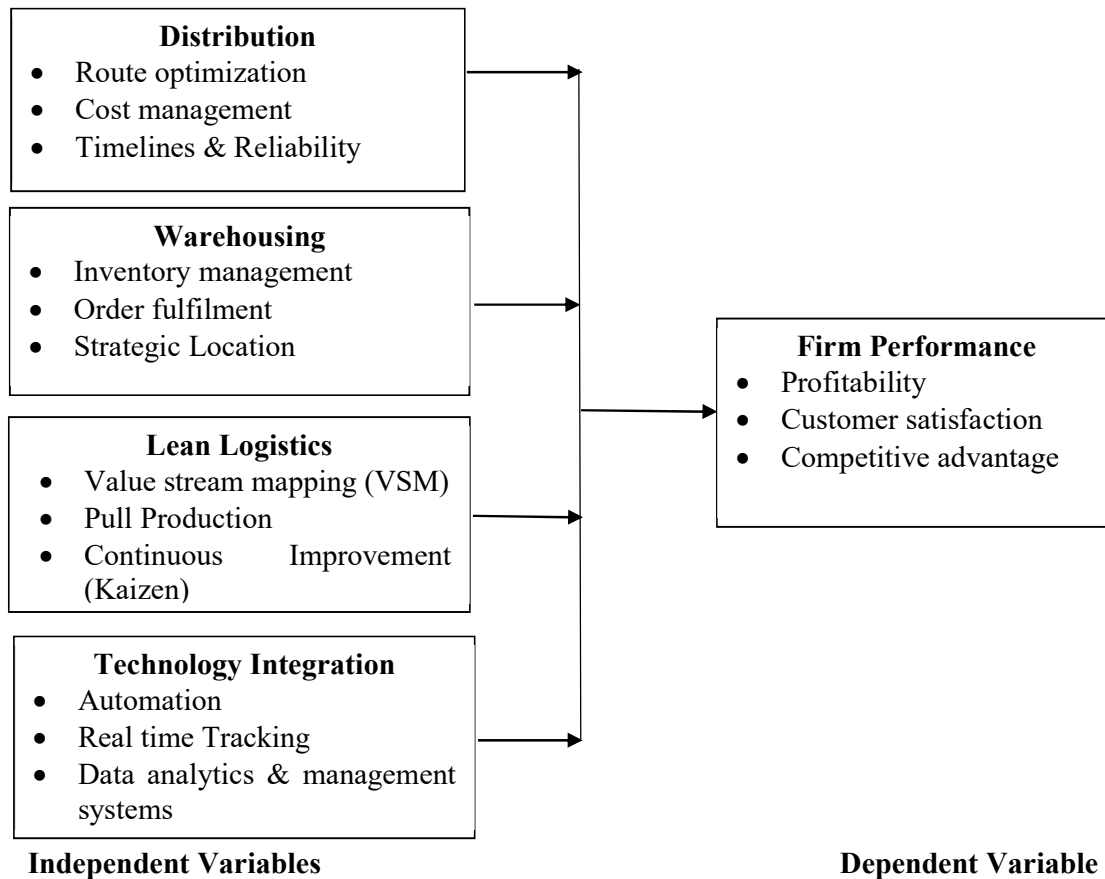


Figure 1: Conceptual Framework

Empirical Review

Giri and Nehayajurvedi (2023) discovered that consumer behavior in online food delivery services is affected by food price, service quality, packaging, advertisement, food quality, food taste, speed of delivery, payment options, offers and discounts, hygiene, delivery tracking, menu, restaurant/grocery store options, delivery person attitude, and convenience. However, a gap exists in understanding how distribution networks specifically influence e-commerce firms in Nairobi City County.

Lebhar, Dadda and Ezzine (2022) noted that 5PL providers increasingly use AI-powered systems for inventory tracking and optimization. Grover & Ashraf (2023) observed that warehousing automation empowers warehouses to achieve higher productivity, accuracy, and customer satisfaction. There are gaps in understanding customized warehousing effectiveness in developing economies.

Ghabish and Amuthakkannan (2024) describe lean logistics as a lean-based approach focusing on eliminating waste throughout the supply chain using value stream mapping, pull production, and continuous improvement. Garcia-Buendia et al. (2022) found positive impacts of lean logistics adoption on organizational competitive advantage. Further studies are needed to evaluate lean logistics adaptability in dynamic, tech-enhanced 5PL environments.

Salim (2023) defines Logistics Information Technology (LIT) innovation as software and hardware facilitating logistical operations. Bhandari (2014) highlighted technologies including barcoding, Auto-ID systems, EDI, GPS, GIS, web-based tracking, and ERP. Elfirdoussi et al. (2020) emphasized ICT's significant enhancement of logistical processes. Most existing studies address general 5PL benefits without assessing unique challenges and opportunities in emerging markets like Nairobi City County.

METHODOLOGY

Research Design

The study employed a descriptive research design. In descriptive research, steps leading to drawing conclusions and establishing correlations between variables are analyzed. Using this setup, study variables are seen as they really are, without outside influences.

Target Population

The target population comprised 30 e-commerce firms licensed to undertake 5PL logistics in Kenya (Communications Authority of Kenya, 2024). The study targeted heads of six key departments: Supply Chain Management, ICT Department, Marketing/Customer Support, Administration, Compliance and Risk Management, and Research and Business Continuity. This represented a population of 180 respondents.

Sample Size and Sampling Techniques

Using Nassiuma's (2000) sampling formula:

$$n = \frac{Nc^2}{c^2 + (N - 1)e^2}$$

Where n = sample size, N = target population (180), c = covariance (30%), e = standard error (2%≤e≤5%).

$$n = \frac{180 * 0.3^2}{0.3^2 + (180 - 1)0.02^2} = 100.248$$

The sample size was 100 respondents, rounded to 102 to accommodate potential non-response. Stratified random sampling ensured proportionate representation from each department.

Data Collection Instruments

A structured questionnaire with both quantitative and qualitative questions was used. The questionnaire featured a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree). The questionnaire was divided into three sections: Section A captured general information; Section B examined 5PL adoption practices; Section C reported 5PL performance effects.

Pilot Study

A pilot study was conducted with 10% of the sample size (10 respondents) from e-commerce firms in Kiambu County. Reliability was tested using Cronbach's alpha, with 0.7 considered acceptable (Bloomfield & Fisher, 2019). Validity was assessed using Content Validity Index (CVI) through expert review.

Data Analysis

Data was analyzed using SPSS Version 30. Descriptive statistics (frequencies, percentages, means, standard deviations) summarized data. Inferential statistics employed correlation analysis and regression analysis. The regression model was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where: Y = Performance of E-commerce Firms, X₁ = Fifth-Party Distribution, X₂ = Fifth Party Customized Warehousing, X₃ = Lean Logistics, X₄ = Technology Integration.

Ethical Considerations

Ethical considerations included obtaining permission from NACOSTI, securing written consent from respondents, fully informing participants about the study purpose and their rights, anonymizing data to protect identities, and ensuring voluntary participation with the right to withdraw at any point.

FINDINGS

Response Rate

Out of 102 questionnaires distributed, 91 were duly filled and returned, representing a response rate of 89.2%, which exceeds the 60% threshold considered adequate for analysis (Kothari, 2014).

Reliability and Validity Results

Cronbach's alpha values for all constructs exceeded 0.7: Distribution (0.909), Customized Warehousing (0.847), Lean Logistics (0.847), Technology Integration (0.777), and Firm Performance (0.859), indicating acceptable reliability. Content Validity Index (CVI) of 0.94 exceeded the minimum threshold of 0.7, validating the research instrument.

The reliability test of the instruments was done using Cronbach's alpha test SPSS version 30 for the five variables. The results were calculated and it was found that all the variables and the instruments were good and acceptable. This is because all the variables were above 0.7. According to established standards, a Cronbach's alpha of 0.7 is considered acceptable for determining reliability. A summary of the reliability analysis for all constructs is presented in Table 1.

Table 1: Reliability Analysis

Construct	No. of Items	Cronbach's Alpha	Reliability Conclusion
Distribution	3	0.909	Reliable
Customized warehousing	3	0.847	Reliable
Lean logistics	3	0.847	Reliable
Technology Integration	3	0.777	Reliable
Firm performance	3	0.859	Reliable

Descriptive Statistics Analysis Results

This sub-section covers the main findings of study based on the descriptive statistics. The main descriptive statistics covered in the findings included the mean, the standard deviation and the percentages. The findings have been captured systematically based on the study's main variables which were: distribution practices, customized warehousing, lean logistics, technology integration and performance of e-commerce firms in Nairobi County, Kenya.

Fifth Party Distribution

The first objective of the study was to establish the relationship between fifth party distribution and performance of e-commerce firms in Nairobi City County. A five-point Likert scale was used to determine the status and the degree to which these logistics practices were implemented in e-commerce firms. The study aimed to evaluate the status of distribution practices within e-commerce firms, with a focus on how logistics were optimized for improved delivery and cost management. The mean standard deviation (SD), and composite mean were computed to assess how firms implement distribution practices. The results are presented in Table 2, the majority of respondents agreed that distribution practices, specifically route optimization, reduced transportation costs, and improved the predictability of delivery schedules, were effectively implemented in their firms. The mean of the item "Route optimization improves distribution" was 4.17, which indicates strong agreement among respondents. Similarly, the mean for "Transportation costs reduced" was 4.11, suggesting a positive impact of distribution practices on operational efficiency. The overall composite mean of 4.10 indicates that distribution practices within the e-commerce firms in Nairobi City County are highly rated. The standard deviations are relatively low, indicating little variability in responses, which suggest a consensus on the effectiveness of distribution practices in these firms.

Table 2: Level of Agreement with Statements on SPL Distribution Practices

Statements	SA	A	N	D	SD	Mean	Std
Route optimization improves distribution	33%	50%	17%	0%	0%	4.17	0.674
Transportation costs reduced	27%	60%	10%	3%	0%	4.11	0.763
Predictability of delivery schedules improved	30%	47%	20%	3%	0%	4.03	0.728
Overall Mean						4.10	0.722

Customized Warehousing Practices in SPL

The second objective of the study was to examine the effect of customized warehousing practices on performance of e-commerce firms. Customized warehousing involves adapting storage practices to meet the specific needs of e-commerce firms, such as inventory management and order fulfilment. Table 3 presents the responses on customized warehousing. The results in Table 8 show that customized warehousing practices are positively rated by e-commerce firms. The mean for the item "Faster order processing time due to warehousing" was 4.13, the highest among the warehousing items, indicating strong agreement among respondents. The composite mean of 4.06 further suggest that customized warehousing practices are seen as a crucial factor in improving operational performance.

Table 3: Descriptive Statistics on Customized Warehousing Practices

Statements	SA	A	N	D	SD	Mean	Std
Reduced stockouts through customized warehousing	23%	57%	13%	7%	0%	4.03	0.834
Faster order processing time due to warehousing	30%	53%	13%	3%	0%	4.13	0.712
Strategic warehouse location improves delivery	27%	50%	17%	7%	0%	4.03	0.742
Overall Mean						4.06	0.763

Fifth Party Lean Logistics

The third objective of the study was to assess the relationship between lean logistics in fifth-party logistics on performance of e-commerce firms in Kenya. The key aspects of lean logistics underscored in this study included the elimination of waste, optimization of resources, and the continuous improvement of logistics process. Table 4 shows the findings. As the results portray, majority of the respondents strongly agreed that lean logistics practices have a significant positive impact on e-commerce performance. The item “Lean Logistics reduces non – value added activities” received the highest mean score of 4.21, indicating that firms highly value the role of lean logistics in eliminating waste and improving operational efficiency. Similarly, “Lean logistics optimizes resource allocation” and “Continuous improvement sustains competitive advantage” were also positively rated, with mean scores of 4.13 and 4.03, respectively.

The overall composite mean of 4.12 and standard deviation of 0.762 indicate that lean logistics practices are considered a crucial factor in improving the performance of e-commerce firms. The relatively low standard deviations across the responses reflect a high level of agreement among respondents about the impact of lean logistics on firm performance.

Table 4: Descriptive Statistics on 5PL Lean Logistics Practices

Statements	SA	A	N	D	SD	Mean	Std
Lean logistics reduces non-value-added activities	37%	50%	10%	3%	0%	4.21	0.731
Lean logistics optimizes resource allocation	30%	53%	13%	3%	0%	4.13	0.742
Continuous improvement sustains competitive advantage	33%	47%	13%	7%	0%	4.03	0.812
Overall Mean						4.12	0.762

Technology Integration in 5PL

The fourth objective of the study was to examine the role of technology integration in 5PL practices. Technology integration, such as real time tracking and automation, is essential in modernizing logistics operations. Table 5 shows the findings on technology integration. As the results portray, respondents highly rated the impact of technology integration on logistics operations. The mean for the item “Automation improves logistics operations” was 4.30, indicating strong agreement. The composite mean of 4.25 suggest that technology integration,

particularly automation and real time tracking, is a key enabler of improved logistics operations within e-commerce firms.

Table 5: Descriptive Statistics on Technology Integration in 5PL

Statements	SA	A	N	D	SD	Mean	Std
Automation improves logistics operations	40%	50%	10%	0%	0%	4.30	0.711
Real time tracking enhances delivery reliability	33%	57%	10%	0%	0%	4.23	0.662
Use of data analytics improves decision making	30%	60%	10%	0%	0%	4.23	0.692
Overall Mean						4.25	0.688

Correlation Analysis

The Pearson correlation analysis established the strength and direction of the relationships between the four 5PL practices and performance of e-commerce firms. The results are presented in Table 6. The results indicate strong positive and statistically significant relationships between firm performance and 5PL distribution ($r = .810$, $p < .01$), customized warehousing ($r = .732$, $p < .01$), lean logistics ($r = .711$, $p < .01$), and technology integration ($r = .732$, $p < .01$). These findings indicate that stronger adoption of 5PL practices is associated with higher e-commerce firm performance.

Table 6: Correlation Analysis Results

		Firm Performance	5PL Distribution	Customized Warehousing	5PL Lean Logistics	Technology Integration
Firm Performance	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	91				
5PL Distribution	Pearson Correlation	.810**	1			
	Sig. (2-tailed)	.000				
	N	91	91			
Customized Warehousing	Pearson Correlation	.732**	.104	1		
	Sig. (2-tailed)	.000	.010			
	N	91	91	91		
5PL Lean Logistics	Pearson Correlation	.711**	.117	.201	1	
	Sig. (2-tailed)	.000	.020	.020		
	N	91	91	91	91	
Technology Integration	Pearson Correlation	.732**	.172	.084	.114	1
	Sig. (2-tailed)	.000	.010	.020	.010	
	N	91	91	91	91	91

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

Regression Analysis

Regression model was carried out to established the combined effect of the four dimensions of 5PL (distribution practices, customized warehousing, lean logistics and technology integration) on performance of e-commerce firms in Kenya. The results as shown in Table 7 revealed that the R-Square as obtained from the model summary was 0.736, implying that when combined, the dimensions of 5PL (distribution practices, customized warehousing, lean logistics and technology integration) were responsible for 73.6% variation in performance of e-commerce firms in Nairobi County, Kenya. The model was found to be statistically significant to predict the relationship between fifth-party logistics and performance of e-commerce firms in Nairobi County, Kenya ($F = 102.621$; $P = 0.000 < 0.05$). The regression coefficients revealed that when combined with the other fifth party logistics aspects, distribution practices had a positive and significant effect on performance of e-commerce firms in Nairobi County, Kenya ($\beta = 0.304$; $P = 0.000 < 0.05$). Customized warehousing was also found to have a significant effect on performance of e-commerce firms in Nairobi County when combined with the other 5PL aspects ($\beta = 0.271$; $P = 0.000 < 0.05$). The results also revealed that lean logistics in 5PL had a significant effect on performance of e-commerce firms in Nairobi County when combined with the other three aspects of 5PL ($\beta = 0.239$; $P = 0.000 < 0.05$). The relationship between technology integration in 5PL and performance of e-commerce firms in Nairobi County was also found to be positive and significant ($\beta = 0.219$; $P = 0.001 < 0.05$). The results imply that when combined, the four aspects of fifth party logistics addressed in this study had a significant and positive effect on performance of e-commerce firms in Nairobi County.

Table 7: Multiple Regression Results

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.858 ^a	.736	.719	.31726		
ANOVA						
Model	Sum of Squares		df	Mean Square	F	Sig.
1 Regression	40.555		4	10.139	102.621	.000 ^b
1 Residual	13.535		86	.098		
Total	54.091		90			
Regression Coefficients						
Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
(Constant)	.218	.147			1.481	.069
1 5PL Distribution Practices	.304	.073	.316		4.162	.000
5PL Customised Warehousing	.271	.062	.278		4.369	.000
5PL Lean Logistics	.239	.058	.263		4.121	.000
Technology Integration in 5PL	.219	.066	.226		3.319	.001

a. Dependent Variable: Performance of E-commerce Firms

a. Dependent Variable: Performance of E-commerce Firms

DISCUSSION

Interpretation of Findings

The findings demonstrate that all four 5PL dimensions significantly influence e-commerce firm performance in Nairobi City County. Distribution practices emerged as the most influential variable ($\beta=0.304$), consistent with Hernandez (2022) who established that 5PL distribution strengthens e-commerce sector effectiveness through speedy deliveries and customer satisfaction. Technology integration showed strong predictive influence ($\beta=0.219$), aligning with Elfirdoussi et al. (2020) who found technology integration essential for strengthening competitive advantage and supply chain intelligence. Customized warehousing demonstrated significant contribution ($\beta=0.271$), supporting Ahmed and Wanjiku's (2023) findings on warehousing customization's role in operational agility. Lean logistics contributed meaningfully ($\beta=0.239$), consistent with Mwangi and Otieno (2024) who established lean logistics in 5PL as essential in reducing bottlenecks and improving throughput.

Implications of the Research

The findings have significant implications for e-commerce firms, policy makers, and academicians. For firms, optimizing 5PL distribution, warehousing, lean logistics, and technology integration can significantly improve performance. For policy makers, findings inform supportive policies and regulatory frameworks to facilitate 5PL adoption. For academicians, the study contributes to existing knowledge on logistics management in the e-commerce context.

Limitations of the Study

The study focused only on e-commerce firms in Nairobi City County, limiting generalizability to other counties or sectors. The cross-sectional design captured perceptions at one point in time, not tracking long-term performance effects. Data reliance on self-reported responses may introduce social desirability bias. The study did not explore potential mediating or moderating variables such as firm size, ownership structure, or competitive intensity.

Suggestions for Future Research

Future research should broaden the scope to include multiple counties or examine urban-rural logistics differences. Longitudinal studies tracking 5PL implementation over time would provide deeper insight into long-term performance effects. Further studies could explore government regulation's role in shaping 5PL adoption and emerging technologies such as artificial intelligence and blockchain in logistics management.

CONCLUSION

The objective of this study was to investigate the impact of fifth party logistics on performance of e-commerce firms in Nairobi City County, Kenya. Through comprehensive analysis, the research examined the specific impact of Distribution, Customized Warehousing, Lean Logistics, and Technology Integration.

The findings demonstrate that distribution practices exert the most significant influence on firm performance, with improvements observed in delivery predictability, route optimization, and cost reduction. Customized warehousing enhances order processing accuracy, reduces stockouts, and improves delivery outcomes through strategic inventory placement. Lean logistics contribute to operational efficiency by minimizing waste and optimizing resource use. Technology integration, including automation, real-time tracking, and data analysis, emerged as a critical driver of enhanced logistics decision-making and overall performance.

Statistical analysis confirmed strong positive correlations between each 5PL practice and firm performance. Despite infrastructural constraints including road congestion, limited system integration capabilities, inadequate employee training, and resistance to change, the study confirms that 5PL practices have the potential to significantly enhance the competitiveness and efficiency of e-commerce operations in Nairobi City County.

The study concludes that 5PL adoption is a key strategic approach for improving competitiveness and efficiency of e-commerce operations. The four 5PL practices collectively account for 73.6% of performance variation, demonstrating the critical importance of integrated logistics management for e-commerce success.

Recommendations

Based on the findings, it is recommended that e-commerce firms increase investment in route optimization technologies, which have been shown to reduce transportation costs and enhance delivery reliability. Scalable warehousing solutions should also be adopted, particularly those that incorporate automated inventory tracking systems to minimize stockouts and accommodate fluctuating customer demand.

Employee training should be prioritized to facilitate the adoption of lean logistics strategies and address resistance to operational changes. Furthermore, it is important for firms to implement end-to-end technology integration across their supply chains, ensuring compatibility between systems and enhancing the accuracy of logistics data.

Finally, regulatory bodies should consider developing frameworks that recognize and support 5PL models, especially through the standardization of logistics technologies and practices that align with modern e-commerce requirements.

REFERENCES

- Ahmed, S., & Wanjiku, L. (2023). Adaptive warehousing strategies and fulfilment efficiency in online retail markets. *Journal of Supply Chain Innovation*, 12(2), 44-58.
- Bhandari, R. (2014). Impact of Technology on Logistics and Supply Chain Management. *IOSR Journal of Business and Management*.
- Bloomfield, J., & Fisher, M. J. (2019). Quantitative research design. *Journal of the Australasian Rehabilitation Nurses Association*, 22(2), 27-30.

- Communications Authority of Kenya. (2023). *Government of Kenya 2023, The Development of E-commerce in Kenya*. <https://www.ca.go.ke/index.php/e-commerce-development>
- Elfirdoussi, S., Hrimech, H., Fontane, F., & Kabaili, H. (2020). Industry 4.0: Impact of New Technologies on Logistics Management. *SpringerLink*.
- Garcia-Buendia, N., Moyano-Fuentes, J., Maqueira, J. M., & Avella, L. (2022). The lean supply chain management response to technology uncertainty. *Journal of Manufacturing Technology Management*, 34(1), 67-86.
- Ghabish, A., & Amuthakkannan, R. (2024). An Impact of Lean Supply Chain Practices in Oil and Gas Sector in Sultanate of Oman. *Turkish Journal of Physiotherapy and Rehabilitation*, 45(1), 4224-4251.
- Giri, A., & Nehayajurvedi, D. (2023). Factors Affecting Consumer Behaviour Towards Online Food Delivery Services Providers in Delhi-NCR.
- Grover, A. K., & Ashraf, M. H. (2023). Leveraging autonomous mobile robots for Industry 4.0 warehouses. *International Journal of Logistics Management*, 35(4), 1168-1199.
- Gull, H., Alabbad, D. A., Saqib, M., Iqbal, S. Z., Nasir, T., Saeed, S., & Almuhaideb, A. M. (2023). E-Commerce and Cybersecurity Challenges. In *Handbook of Research on Cybersecurity Issues and Challenges for Business and FinTech Applications* (pp. 91-111). IGI Global.
- Hernandez, A. (2022, April 22). *Types of logistics operators 1PL, 2PL, 3PL, 4PL and 5PL*. <https://www.ewebtrans.com/blog/en/1pl-2pl-3pl-4pl-5pl-logistics-operators-differences-advantages/>
- International Trade Administration. (2024, July 5). *Kenya—Country Commercial Guide*. <https://www.trade.gov/country-commercial-guides/kenya-ecommerce>
- Kero, C. A., & Bogale, A. T. (2023). A Systematic Review of Resource-Based View and Dynamic Capabilities of Firms. *International Journal of Sustainable Development and Planning*, 18(10), 3137-3154.
- Kothari, C. R. (2014). *Research Methodology: Methods and Techniques*. New Age International.
- Lebhar, I., Dadda, A., & Ezzine, L. (2022). Artificial Intelligence Applications in the Global Supply Chain. *SpringerLink*.
- Mwangi, D., & Otieno, R. (2024). Waste reduction and process efficiency through lean logistics in outsourced supply chains. *Journal of Operations and Value Systems*, 7(1), 15-29.
- Nagle, F., Seamans, R., & Tadelis, S. (2024). Transaction cost economics in the digital economy. *Strategic Organization*, 14761270241228674.
- Paksoy, T., Koçhan, Ç., & Ali, S. S. (2021). *Logistics 4.0: Digital transformation of supply chain management*. CRC Press.

- Salim, H. B. M. (2023). Determinants of Logistics Information Technology (LIT) Innovation Implementation Towards Firm Performance by Logistics Service Providers (LSPs) in Malaysia.
- Statista. (2023). *eCommerce—Kenya* | Statista Market Forecast. <https://www.statista.com/outlook/emo/ecommerce/kenya>
- UNCTAD. (2022). *Fast-tracking eTrade Readiness Assessment Implementation: A snapshot of UNCTAD's support*.
- Winqvist, C. (2023). *Optimizing supply chain in Ecommerce through fifth party logistics (5PL)*. <http://www.theseus.fi/handle/10024/813641>