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Inventory Management Practices and Operational Performance of International Pharmaceutical Firms in Nairobi County, Kenya

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Abstract: **International pharmaceutical firms in Kenya carry much of the country's medicine supply, and stock-outs, expiries and slow order fulfilment in these firms translate directly into gaps in the availability of medicines. This study examined the influence of four inventory management practices, namely supplier partnership, supply records management, adoption of ICT practices and cycle inventory counting, on the operational performance of international pharmaceutical firms in Nairobi County, drawing on the resource-based view, dynamic capabilities theory and the Technology Acceptance Model. An explanatory cross-sectional survey design was adopted. From a population of 850 employees involved in inventory and operational decisions, a stratified random sample of 272 was drawn, and 240 usable questionnaires were returned (88.2 per cent). Data were analysed using descriptive statistics, Pearson correlation and multiple linear regression. All four practices were rated only moderately, with ICT adoption lowest (M = 3.43) and the use of computerised inventory systems the weakest single item. The four practices jointly explained 47.1 per cent of the variation in operational performance (adjusted R^2 = .462; F(4, 235) = 52.30, p < .001), and each had a positive and significant effect: supply records management (β = .288, p < .001), cycle inventory counting (β = .281, p < .001), adoption of ICT practices (β = .195, p < .001) and supplier partnership (β = .148, p = .008). The study concludes that the integrity of inventory information is the strongest lever on operational performance, and recommends real-time, audited supply records, cycle counts scheduled by stock value and movement, full deployment of integrated inventory systems, and a shift from transactional to collaborative supplier relationships.**

Keywords: **inventory management; supplier partnership; records management; cycle counting; ICT adoption; operational performance; pharmaceutical supply chain; Kenya.**

1. INTRODUCTION

In the pharmaceutical industry, weak operational performance is not only a commercial problem. A stock-out of an essential medicine, a batch that expires on the shelf or an order that arrives late reaches the patient as a gap in treatment, so the way firms manage inventory has consequences well beyond their own costs. Inventory management in this setting must balance the cost of holding stock against the risk of running out, while meeting regulatory requirements for traceability, storage and expiry control. Those decisions are only as good as the information on which they rest. In a study of nearly 370,000 inventory records across 37 stores of a large retailer, DeHoratius and Raman (2008) found that about 65 per cent of records did not match the physical stock, and modelling work shows that such inaccuracies, if left uncorrected, accumulate into avoidable stock-outs (Kang & Gershwin, 2005).

International pharmaceutical firms are a central part of Kenya's medicine supply, and most of them run their Kenyan operations, warehousing and distribution from Nairobi. These firms have invested in enterprise resource planning systems, barcode tracking and closer relationships with suppliers, yet stakeholders continue to report stock-outs, rising logistics costs and inconsistent order fulfilment. The Kenyan evidence on why this happens is thin. Onyango (2020) showed that technology in supply chain, marketing and quality-control functions was positively related to the operational performance of pharmaceutical firms in Nairobi, and Akwalu (2022) found that inter-organisation systems strengthened the link between supply chain relationship management and the performance of Kenyan pharmaceutical firms. Neither study examined the information-focused practices of inventory control, namely the management of supply records and the routine verification of stock through cycle counting, alongside supplier relationships and ICT in a single model.

This study addresses that gap by examining the influence of four inventory management practices on the operational performance of international pharmaceutical firms in Nairobi County. Specifically, it sought to establish the effects of supplier partnership, supply records management, adoption of ICT practices and cycle inventory counting on operational performance, measured through cost efficiency, delivery reliability, stock availability and customer satisfaction. The findings are intended to help managers decide where investment in inventory management is likely to yield the largest operational return.

2. LITERATURE REVIEW

2.1 Theoretical Literature

Three theories anchor the study. The first is the resource-based view, in which Barney (1991) argues that firms gain a sustained advantage from resources that are valuable, rare, difficult to imitate and difficult to substitute. Accurate inventory records, well-run counting routines and relationships of trust with key suppliers fit this description, because they are built up over time within a particular firm and cannot simply be bought. The view also implies that the information a firm holds about its own stock is itself a resource, whose quality determines how well its physical inventory can be used. Dubey et al. (2019) applied the resource-based view to manufacturing performance and found that the capability to use data and predictive analytics contributed to performance, particularly where the organisational culture supported it.

Where the resource-based view explains why such resources matter, dynamic capabilities theory explains how firms keep them relevant in changing conditions. Teece, Pisano and Shuen (1997) define dynamic capabilities as the firm's ability to integrate, build and reconfigure internal and external competences in response to rapidly changing environments, and Teece (2007) later described them in terms of sensing opportunities and threats, seizing them, and transforming the firm's resource base. In pharmaceutical supply chains, which face demand shocks, regulatory change and supply disruption, the routines that detect discrepancies in stock and records, and the relationships that allow plans to be adjusted with suppliers, are the operational form of these capabilities.

The third perspective, the Technology Acceptance Model, addresses the human side of ICT adoption. Davis (1989) proposed that the use of an information system depends on users' perceptions of its usefulness and ease of use, and Venkatesh and Davis (2000) extended the model to include social influence and cognitive judgements of job relevance and output quality. Reviewing its application in health care, Holden and Karsh (2010) and Mutuku (2019) concluded that the model predicts technology use well but needs to take more account of the organisational context in which systems are implemented. For inventory systems, the model implies that investment in ERP, warehouse management or barcode technology will improve performance only to the extent that staff accept and use the systems as intended. Drawing these perspectives together, the study modelled operational performance as a function of supplier partnership, supply records management, adoption of ICT practices and cycle inventory counting.

2.2 Empirical Literature

Turning to the empirical evidence, studies of supplier relationships point to trust and the quality of information exchange, rather than collaboration in itself, as what matters most. In a survey of managers at 35 pharmaceutical companies in Pakistan, Khan and Siddiqui (2018) found that strategic supplier partnership and the quality of information sharing improved supply chain performance, whereas the sheer level of information sharing had a negative effect. Kusemererwa (2023) similarly found, among 164 respondents at a Ugandan financial institution, that trust and information sharing with suppliers significantly affected operational performance while supplier collaboration did not. In Kenya, Akwalu (2022)

surveyed 171 pharmaceutical manufacturers and importers and found that supply chain relationship management was related to performance and that inter-organisation information systems moderated that relationship.

A second strand of evidence concerns the records on which inventory decisions depend. In a survey of 164 government procurement management units in Tanzania, Matto (2022) found that records management had a significant effect on procurement performance. Henninger and Mashatan (2021) argue that fragmented, non-interoperable records are a root cause of poor visibility in supply chains and that shared, verifiable records would improve coordination between partners. The scale of the problem is illustrated by DeHoratius and Raman (2008), who found record inaccuracy to be widespread and to vary with item characteristics such as cost and selling rate and with the variety of products a store holds, features that are pronounced in pharmaceutical inventories.

Closely linked to records is the use of ICT in inventory and operations. Onyango (2020) surveyed 200 managers in 50 pharmaceutical firms in Nairobi and found that supply chain technology, marketing technology and quality-control technology were each positively related to operational performance. Across the Middle East and North Africa, Al-Shboul (2024) studied 95 managers of pharmaceutical manufacturers in Jordan, Saudi Arabia, Morocco and Algeria and found that technological and infrastructure capability, together with supplier reliability, supported the adoption of AI-based systems and improved supply chain performance. In manufacturing more broadly, Mutuku, (2020) and Buer et al. (2021), showed that lean practices and digitalisation each improved operational performance and that their combination was complementary, which suggests that technology works best when it supports well-designed routines rather than replacing them.

The fourth practice, cycle counting, has received less direct empirical attention than the others, but the evidence on inventory control points the same way. Kang and Gershwin (2005) showed that small, undetected stock losses cause record inaccuracy to grow over time and produce stock-outs even under well-designed replenishment policies, and they evaluated periodic verification of stock as one of the ways of correcting such errors. In a panel of Polish food-industry sectors over 2005 to 2017, Gołaś (2020) found that more efficient inventory management was associated with higher return on operating assets. In Kenya, Muema and Achuora (2020) found that inventory management, together with warehousing, order processing and transport management, had positive and significant effects on the supply chain performance of 96 manufacturing firms, and in Ethiopia's public pharmaceutical supply system Necho (2017) found that management support and staff competence were significantly associated with the quality of inventory management practice. Taken together, these studies support a positive relationship between each practice and performance, but none examines the four together among international pharmaceutical firms in Kenya, which is the gap this study addresses.

3. RESEARCH METHODOLOGY

The study used an explanatory, cross-sectional survey design, which suited its purpose of estimating the direction and strength of the relationships between inventory management practices and operational performance at one point in time. The unit of analysis was the internationally owned pharmaceutical firm with operational or distribution facilities in Nairobi County, of which about ten were registered with the Pharmacy and Poisons Board and the Kenya Association of Pharmaceutical Industry at the time of the study. The unit of observation was the employees of these firms who take part in inventory and operational decisions, drawn from senior, middle and operational levels in six functions: supply chain and procurement, inventory and warehousing, operations and production, finance and administration, information technology, and quality assurance and compliance. These functions employed an estimated 850 staff.

The sample size was determined with Yamane's (1967) formula at a 5 per cent margin of error, giving 272 respondents, who were allocated proportionately across management levels and functions and selected by stratified random sampling. Data were collected with a structured questionnaire administered in person and electronically. Each of the five constructs was measured with eight items on a five-point scale from strongly disagree (1) to strongly agree (5): supplier partnership (trust, joint planning, information sharing, delivery reliability and feedback), supply records management (accuracy, timeliness, authorisation, real-time updating and audit of records), adoption of ICT practices (use and integration of ERP or warehouse management systems, barcoding or RFID, staff competence and system reliability), cycle inventory counting (frequency, basis, reconciliation, resourcing and post-count analysis), and operational performance (holding and operating costs, timeliness and accuracy of order fulfilment, stock-outs and overstocking, turnaround time and customer satisfaction).

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The instrument was reviewed for content validity against the study objectives and pre-tested with 27 staff of a pharmaceutical firm that was not part of the final sample. Data were analysed in SPSS using descriptive statistics, Pearson correlation and multiple linear regression of the form $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$, where Y is operational performance and X_1 to X_4 are supplier partnership, supply records management, adoption of ICT practices and cycle inventory counting. Normality was assessed with skewness and kurtosis and multicollinearity with tolerance and variance inflation factors. A research permit was obtained from the National Commission for Science, Technology and Innovation and permission from the participating firms, informed consent was obtained from each respondent, and neither respondents nor firms are identified in the results.

4. RESEARCH FINDINGS AND DISCUSSIONS

4.1 Response rate and respondent profile

Of the 272 questionnaires distributed, 240 were returned complete and usable, a response rate of 88.2 per cent, which comfortably exceeds the 70 per cent that Mugenda and Mugenda (2003) regard as very good. Respondents were drawn from all six functions, and from senior, middle and operational levels. Most were experienced and well qualified: 79.2 per cent had worked in their firm for three years or more, a third for six to ten years, 58.3 per cent held a bachelor's degree and a further 28.3 per cent a postgraduate qualification. They were therefore well placed to judge the inventory practices and operational outcomes of their firms.

4.2 Descriptive statistics

Table 1 summarises the five constructs. Every scale was highly reliable, with Cronbach's alpha between .920 and .931, comfortably above the .70 benchmark suggested by Tavakol and Dennick (2011), and skewness and kurtosis values within ±1 indicate approximately normal distributions. All four practices fall within the agreement band, but only moderately so. Cycle inventory counting (M = 3.55) and supply records management (M = 3.57) were rated highest, supplier partnership slightly lower (M = 3.53) and adoption of ICT practices lowest (M = 3.43). Operational performance was rated at the same moderate level (M = 3.43, SD = 0.98).

Table 1. Reliability and descriptive statistics for the study constructs (n = 240)

Construct	Items	Alpha	Mean	Std. dev.	Skewness	Kurtosis
Supplier partnership	8	.931	3.53	0.97	−0.289	−0.843
Supply records management	8	.931	3.57	0.96	−0.399	−0.607
Adoption of ICT practices	8	.920	3.43	0.93	−0.333	−0.571
Cycle inventory counting	8	.927	3.55	0.94	−0.373	−0.595
Operational performance	8	.928	3.43	0.98	−0.248	−0.844

Source: Survey data (2026). Scale: 1 = strongly disagree to 5 = strongly agree.

The item-level results show where each practice is weakest. In supplier partnership, delivery to agreed quality standards was rated highest (M = 3.64) and long-term, trust-based relationships with key suppliers lowest (M = 3.40), so firms appear to obtain reliable quality from suppliers without having built the deeper relationships on which joint planning depends. In supply records management, respondents most strongly agreed that accurate records support better decisions (M = 3.69) but were least confident that records actually match physical stock (M = 3.49). Adoption of ICT practices showed the clearest gap: staff were rated as reasonably competent with ICT tools (M = 3.56), yet the use of a computerised inventory system such as ERP or WMS was the lowest-rated item in the entire instrument (M = 3.30), and barcoding or RFID tracking (M = 3.38) and integration across procurement, warehousing and sales (M = 3.39) were also weak. In cycle counting, post-count analysis was rated highest (M = 3.70) and setting count frequency by stock value and movement lowest (M = 3.45). Among the performance indicators, customer satisfaction arising from reliable supply was rated highest (M = 3.54), while reductions in holding and carrying costs (M = 3.31) and turnaround times (M = 3.33) were rated lowest, which identifies cost efficiency and speed as the weakest dimensions of operational performance.

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4.3 Correlation and regression results

All four practices are positively and significantly correlated with operational performance at the 1 per cent level (Table 2). Supply records management shows the strongest association (r = .554), followed closely by cycle inventory counting (r = .544), adoption of ICT practices (r = .473) and supplier partnership (r = .447). The correlations among the practices themselves are moderate (r = .294 to .443), and tolerance values of 0.683 to 0.758, with variance inflation factors of 1.319 to 1.463, rule out problematic multicollinearity.

Table 2. Pearson correlation matrix (n = 240)

Variable	SP	SRM	ICT	CIC	OP
Supplier partnership (SP)	1				
Supply records management (SRM)	.443	1			
Adoption of ICT practices (ICT)	.294	.415	1		
Cycle inventory counting (CIC)	.406	.424	.410	1	
Operational performance (OP)	.447	.554	.473	.544	1

Source: Survey data (2026). All coefficients significant at p < .01 (two-tailed).

Table 3. Multiple regression of operational performance on inventory management practices (n = 240)

Predictor	B	Std. error	Beta	t	p
(Constant)	0.098	0.238	—	0.412	.680
Supplier partnership	0.150	0.056	.148	2.690	.008
Supply records management	0.294	0.059	.288	5.018	< .001
Adoption of ICT practices	0.207	0.058	.195	3.578	< .001
Cycle inventory counting	0.295	0.059	.281	4.993	< .001

Source: Survey data (2026). R = .686, R^2 = .471, adjusted R^2 = .462, SE of estimate = 0.721; F(4, 235) = 52.300, p < .001.

The four practices jointly explain 47.1 per cent of the variation in operational performance (adjusted R^2 = .462), and the model is highly significant, F(4, 235) = 52.300, p < .001. The estimated equation is OP = 0.098 + 0.150SP + 0.294SRM + 0.207ICT + 0.295CIC. Each practice makes a positive and significant independent contribution. Supply records management (β = .288, p < .001) and cycle inventory counting (β = .281, p < .001) have the largest and almost identical standardised effects, so that, holding the other practices constant, a one-point improvement in either is associated with an improvement of about 0.29 points in operational performance. Adoption of ICT practices follows (β = .195, p < .001), and supplier partnership has the smallest but still significant effect (β = .148, p = .008).

These results are consistent with the evidence reviewed earlier and add to it in one important respect. The strong effects of supply records management and cycle inventory counting fit the finding of DeHoratius and Raman (2008) that record inaccuracy is widespread, and the argument of Kang and Gershwin (2005) that uncorrected discrepancies accumulate into stock-outs. In firms where respondents were least confident that records match physical stock, the practices that keep records accurate are, unsurprisingly, the ones most closely tied to performance. The significant effect of records management also agrees with Matto (2022), who found a similar effect in public procurement units. The effect of ICT is consistent with Onyango (2020) for Nairobi pharmaceutical firms and with Al-Shboul (2024) for the wider region, and the contrast between relatively high ratings of staff competence and low ratings of system deployment echoes the conclusion of Holden and Karsh (2010) that acceptance alone does not deliver the benefits of a system without the organisational conditions for its use.

The smaller effect of supplier partnership is also in line with earlier work. Khan and Siddiqui (2018) and Kusemererwa (2023) found that the quality of information and the level of trust, rather than collaboration as such, drive the benefits of supplier relationships. In this study, trust-based, long-term relationships were the weakest aspect of supplier partnership, which may explain why partnership contributes less than the internal practices. Viewed through the resource-based view, the internal information resources of the firm, namely its records and the routines that verify them, appear to be more fully developed, and therefore more valuable, than its relational resources with suppliers.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The study concludes that inventory management practices have a positive and significant effect on the operational performance of international pharmaceutical firms in Nairobi County, and that the practices concerned with the integrity of inventory information matter most. Supply records management and cycle inventory counting have the largest effects, which supports the resource-based view that accurate, firm-specific information about stock is a valuable internal resource, and suggests that the routine verification and correction of records is the most direct route to better cost efficiency, fulfilment and stock availability. Adoption of ICT practices also contributes significantly, but it is the least developed practice, with computerised inventory systems, automated identification and cross-functional integration all rated weakly. Supplier partnership has the smallest effect, which, together with its low rating for trust-based relationships, suggests that the firms' supplier relationships are more transactional than collaborative.

Read through dynamic capabilities theory and the Technology Acceptance Model, these results describe firms that have the operational routines of good inventory control in place but have not yet fully converted them into an integrated, technology-enabled capability. Respondents judge themselves competent with ICT tools, yet the systems that would make records accurate and counts timely by design are incompletely deployed. Operational performance is correspondingly moderate, with cost efficiency and turnaround time its weakest dimensions.

5.2 Recommendations

In light of these conclusions, management of international pharmaceutical firms in Nairobi should first strengthen the accuracy of supply records. Recording receipts and issues at the time of each transaction, requiring authorisation for every stock movement and conducting periodic record audits would address the weakest records item, the match between recorded and physical stock, and would support the replenishment and expiry decisions that depend on it.

Beyond record-keeping, cycle counting should be scheduled according to stock value and movement, for example by giving high-value and fast-moving lines more frequent counts, with adequate staff time allocated, discrepancies reconciled promptly and post-count analysis used to correct the underlying causes of error. Equally, firms should complete the deployment of computerised inventory systems such as ERP and warehouse management systems, extend barcode or RFID tracking and integrate procurement, warehousing and sales data, so that accurate records and timely counts become features of the system rather than of individual effort, supported by continued user training and technical support.

Supplier relationships should also be moved from reliable delivery towards genuine partnership through joint planning and forecasting with key suppliers, formal information-sharing arrangements and regular performance feedback. Finally, further research should test the model against objective operational data, such as stock-out frequency, order-cycle time and inventory turnover, rather than staff perceptions alone, should analyse responses at firm level or with methods that account for the clustering of employees within a small number of firms, and should extend the comparison to local and generic manufacturers and to other practices such as demand forecasting and warehouse automation, since more than half of the variation in performance remains unexplained.

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