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Effect of Inventory Management Digitalization and the Performance of Supply Chain: Case study of Ubipharm Rwanda Wholesalers

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Abstract: *This study examined the effect of digital inventory systems on supply chain performance at UBIPHARM RWANDA. Specifically, it examined whether computerized inventory records, integration with other business systems, improved stock-record accuracy, and reduction of medicine stock-outs were associated with better supply chain performance. A mixed research design was used, with quantitative and qualitative approaches. The study targeted 32 employees, and census sampling was used, resulting in a 100% response rate. Data were collected using structured questionnaires and interviews and analyzed using SPSS. Descriptive statistics and Pearson Product Moment Correlation were used to summarize the findings and establish the relationship between digital inventory systems and supply chain performance. The findings showed a moderate level of digital inventory-system implementation, with an overall mean of 3.61. Pearson correlation showed a strong positive and statistically significant relationship between digital inventory systems and supply chain performance ($r = .716$, $p = .000$, $N = 32$). The original multiple regression output further showed a positive and statistically significant contribution of digital inventory systems within the broader model ($\beta = .394$, $t = .304$, $p = .003$). The study concludes that stronger digital inventory systems are associated with improved supply chain performance and recommends strengthening system integration, staff capacity, inventory reconciliation, and technical support.*

Keywords: Digital inventory systems, Supply chain performance, Pharmaceutical supply chain, Inventory management, UBIPHARM RWANDA

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1. Introduction

Inventory management is an important function within pharmaceutical supply chains because medicines must be available when required while unnecessary costs, wastage, expiry, and stock-outs are minimized. Effective inventory management enables pharmaceutical organizations to maintain appropriate stock levels, monitor stock movement, coordinate procurement, and respond to changes in demand. The importance of this function is greater in pharmaceutical distribution because inventory decisions can affect not only organizational efficiency but also the availability of products required by healthcare providers and patients. Supply chain performance therefore depends substantially on the quality, accuracy, and timeliness of inventory information available to managers and operational staff (Ishaq Bhatti et al., 2014).

At the global level, pharmaceutical supply chains operate in complex environments characterized by changing demand, procurement uncertainty, strict storage requirements, regulatory obligations, and financial pressures. Traditional inventory management practices that depend heavily on paper records, manual stock counts, and fragmented information can make it difficult to maintain accurate information about inventory levels and product movement. Such weaknesses may result in stock discrepancies, delayed reporting, overstocking, stock-outs, wastage, and inefficient use of resources. The increasing complexity of pharmaceutical distribution has therefore encouraged organizations to adopt digital technologies that can improve inventory visibility and support timely decisions (Soni & Patel, 2024; Klibi et al., 2025).

Digital inventory systems represent one important component of this transformation. They include computerized inventory records and integrated systems that support recording, monitoring, reporting, and control of inventory activities. Depending on the organization, digital systems may be linked to procurement, sales, finance, warehousing, and logistics functions. Technologies such as Enterprise Resource Planning systems, Warehouse Management Systems, barcode systems, Radio Frequency Identification, and other electronic platforms can reduce dependence on manual processes and improve the availability of inventory information. Digitalization can consequently strengthen inventory accuracy, reduce errors, support replenishment decisions, and improve coordination across supply chain functions (Larutama et al., 2022a; Budiyanto & Muslim, 2024).

The concept of Supply Chain 4.0 has further increased attention to digital technologies as instruments for improving visibility, responsiveness, flexibility, and efficiency. In pharmaceutical supply chains, digital technologies can support the monitoring of medicine availability, stock movement, order processing, and operational activities. When information is available in a timely and reliable form, managers can make better decisions concerning procurement, storage, replenishment, and distribution. Digital inventory systems can therefore contribute to improved supply chain outcomes by strengthening the information base upon which supply chain decisions are made (Taifa & Nzowa, 2025).

Despite these potential benefits, the adoption of digital inventory systems is not equally successful across organizations and countries. Developing-country supply chains may face limitations related to infrastructure, financial resources, technical skills, staff training, resistance to change, and system integration. Klibi et al. (2025) highlight infrastructure-related challenges in African supply chains, while Ogunye et al. (2024) identify financial and technological constraints affecting the adoption of emerging technologies in African pharmaceutical operations. Skoumpopoulou et al. (2025) further emphasize the importance of employee skills, organizational support, and change management in achieving successful digital transformation.

In Rwanda, digital transformation has become an important component of efforts to improve efficiency and service delivery. Digital technologies have increasingly been applied in healthcare and supply chain activities, including inventory information and logistics management. However, much of the available evidence concerns public healthcare institutions and government-managed supply chains. Private pharmaceutical wholesalers play an important role in medicine distribution, yet comparatively limited empirical evidence is available concerning the relationship between digital inventory systems and supply chain performance in these organizations.

UBIPHARM RWANDA provides an important organizational setting for examining this issue. The organization is involved in pharmaceutical procurement, inventory management, warehousing, order processing, storage, and distribution. These activities require accurate inventory information and effective coordination among departments. The source study indicates that UBIPHARM RWANDA has adopted digital inventory systems, but the level of implementation remains moderate and some manual processes continue to exist. The study therefore focused on the first specific objective of the original research, namely examining the effect of digital inventory systems on supply chain performance at UBIPHARM RWANDA.

1.2 Statement of the Problem

Pharmaceutical wholesalers must maintain adequate medicine stocks while controlling the costs and operational risks associated with procurement, storage, inventory handling, and distribution. When inventory information is inaccurate, delayed, or fragmented, organizations may experience stock discrepancies, stock-outs, excessive inventory, delayed order processing, and inefficient use of resources. These problems can affect the ability of a wholesaler to provide medicines to customers on time and at the required quantity. Inventory management is therefore closely connected to supply chain performance because it influences procurement decisions, warehouse operations, order fulfillment, responsiveness, and customer service (Ishaq Bhatti et al., 2014).

Traditional inventory practices can contribute to these challenges when they depend on paper-based records, manual reconciliation, periodic physical counting, and disconnected information systems. Such practices may increase the possibility of human error and delay the availability of information required for operational

decisions. Digital inventory systems are intended to address these weaknesses by providing computerized records, improving stock visibility, linking inventory information with other business functions, and supporting faster reporting. Previous studies have associated digital inventory systems with improved inventory accuracy, warehouse efficiency, and supply chain visibility (Destro et al., 2023; Budiyanto & Muslim, 2024).

However, the existence of a digital system does not automatically mean that an organization will achieve full operational benefits. Effective implementation requires appropriate system integration, user competence, technical support, and consistent use across departments. Evidence from the source study indicates that digital inventory systems at UBIPHARM RWANDA were moderately implemented, with an overall mean of 3.61. The study also reported that some departments still used manual backup records, integration with finance and sales was still developing, and occasional discrepancies between physical and system stock remained.

Previous empirical studies provide useful evidence, but important contextual gaps remain. Destro et al. (2023) examined inventory record accuracy in distribution centers, while Bekele et al. (2025) examined electronic inventory management in public health facilities in Ethiopia. These studies support the importance of digital inventory systems, but their institutional and geographical contexts differ from a private pharmaceutical wholesaler in Rwanda. Kigenza et al. (2023) provides evidence from Rwanda's health supply chain, but the focus is broader and does not specifically isolate the effect of digital inventory systems within a private pharmaceutical wholesaler.

Therefore, the problem addressed by this study is the limited organization-specific evidence on the effect of digital inventory systems on supply chain performance at UBIPHARM RWANDA. The study sought to establish whether computerized inventory records, integration with other business systems, improved stock-record accuracy, and reduced stock-outs are associated with improved supply chain performance. Addressing this problem is important because evidence from the organization can help managers identify areas where digital inventory practices require strengthening and can contribute to the limited literature on private pharmaceutical supply chains in Rwanda.

1.3 Purpose of the Study

The purpose of this study was to determine the effect of inventory management digitalization and the supply chain performance at UBIPHARM RWANDA. The study focused on the practical application of computerized inventory records, integration of digital inventory systems with other business functions, improvement of stock-record accuracy, and reduction of medicine stock-outs. It sought to establish whether effective application of these digital inventory practices contributes to better inventory accuracy, operational efficiency, order fulfillment, responsiveness, cost performance, and customer satisfaction.

1.4 Study Objective

1.4.1 Specific Objective

The study was guided by the following specific objective:

i. To examine the effect of digital inventory systems on the supply chain performance of UBIPHARM RWANDA.

1.5 Research Hypothesis

H_{01}: Digital inventory systems have no statistically significant effect on the supply chain performance of UBIPHARM RWANDA.

1.6 Significance of the Study

The study is significant to UBIPHARM RWANDA management because it provides empirical evidence on the extent to which digital inventory systems are associated with supply chain performance. The findings can assist management in identifying weaknesses in computerized record keeping, system integration, stock reconciliation, and stock-out control. They can also support decisions concerning future investment in inventory technologies and organizational support mechanisms required to obtain greater benefits from digital systems.

The study is also relevant to managers and employees responsible for procurement, warehousing, pharmacy, logistics, and information technology. Digital inventory systems require cooperation among these functions because inventory information is created, updated, and used across departments. Understanding the contribution of digital systems can encourage stronger coordination, better data management, and more consistent use of computerized inventory information in daily operations.

For policymakers and stakeholders in Rwanda's pharmaceutical sector, the study provides organization-level evidence concerning digital transformation in private pharmaceutical distribution. The findings may contribute to discussions on supply chain modernization, digital health systems, medicine availability, and operational efficiency. Academically, the study contributes to the limited empirical literature concerning digital inventory systems and supply chain performance in private pharmaceutical wholesalers in Rwanda.

2. Literature Review

This section reviews literature related to digital inventory systems and supply chain performance. It presents the conceptual review, theoretical framework, empirical review, conceptual relationship, and research gap. The review is deliberately restricted to digital inventory systems because they constitute the independent variable addressed by the specific objective of the revised manuscript. The discussion therefore does not treat real-time tracking, data analytics integration, or adoption barriers as separate independent variables.

2.1.1 Digital Inventory Systems

Digital inventory systems refer to computerized technologies and applications used to record, monitor, control, and report inventory activities. They can replace or reduce manual record keeping by creating electronic records of stock levels, inventory transactions, receipts, issues, and other inventory movements. In pharmaceutical organizations, digital systems are especially important because medicines require accurate records, proper storage, batch traceability, and monitoring of availability and expiry. Reliable digital information can therefore support both operational decisions and service delivery (Akande Sodiq Adedunjoye & Joy Onma Enyejo, 2024).

Digital inventory systems may take different forms depending on the technological maturity of an organization. Enterprise Resource Planning systems can connect inventory with procurement, sales, and finance functions, while Warehouse Management Systems can support receiving, storage, picking, packing, and dispatch. Barcode and Radio Frequency Identification technologies can automate product identification and movement recording. These technologies reduce dependence on manual data entry and can provide more timely information about inventory positions and transactions (Larutama et al., 2022a; Budiyanto & Muslim, 2024).

For the present study, digital inventory systems are operationalized through four main practices identified in the source questionnaire. These include replacement of manual paper-based records with computerized records, integration of digital inventory systems with procurement, sales, and finance, improvement in the accuracy of stock records, and reduction in medicine stock-outs. These indicators capture both the technological presence of digital systems and their practical contribution to inventory control.

Digital inventory systems can improve supply chain operations because accurate inventory information reduces uncertainty. When managers know what products are available, where they are located, and how quickly they are moving, they can make better procurement and replenishment decisions. Improved information can also reduce discrepancies between physical and recorded stock and support timely order fulfillment. Destro et al. (2023) and Budiyanto and Muslim (2024) provide evidence that digital inventory practices can improve accuracy and visibility.

2.1.2 Supply Chain Performance in Pharmaceutical Distribution

Supply chain performance refers to the effectiveness and efficiency with which an organization manages the flow of products, information, and related activities from suppliers to customers. It reflects the extent to which supply chain operations achieve objectives relating to service, cost, responsiveness, resource utilization, and customer satisfaction. In pharmaceutical distribution, supply chain performance is particularly important because delays or inaccuracies in product availability can affect healthcare providers and patients as well as organizational outcomes (Ishaq Bhatti et al., 2014).

Supply chain performance can be assessed through several operational indicators. Inventory accuracy reflects the consistency between physical stock and recorded information. Order fulfillment concerns the ability to satisfy customer orders accurately and on time. Responsiveness concerns the organization's ability to react to changes in demand, while cost performance concerns the efficient use of financial and operational resources. Customer satisfaction reflects whether customers receive the required products and services at the expected quality and time.

In the present study, supply chain performance was measured using statements concerning inventory accuracy, supply chain efficiency, timely order fulfillment, responsiveness to demand changes, cost reduction, and customer satisfaction. These indicators are relevant to a pharmaceutical wholesaler because the organization must coordinate procurement, warehousing, inventory, and distribution activities to ensure medicine availability and reliable customer service.

2.2 Theoretical Framework

This study is anchored in the Technology Acceptance Model (TAM) because the specific objective focuses directly on the effect of digital inventory systems. The theory is particularly relevant because digital inventory systems can only generate operational benefits when employees understand, accept, and consistently use them. The source thesis also identifies TAM as one of the main theories underlying the broader study (Rahimi et al., 2018).

2.2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model explains users' acceptance and use of information technology through

perceptions concerning usefulness and ease of use. Perceived usefulness refers to the extent to which users believe that a technology can improve their work performance, while perceived ease of use concerns how easy the technology is perceived to be in learning and operation. In organizational settings, these perceptions influence whether employees are willing to use a technology and whether they use it effectively (Rahimi et al., 2018).

TAM is relevant to UBIPHARM RWANDA because digital inventory systems are used by employees who perform procurement, warehouse, pharmacy, logistics, information technology, and management activities. If employees perceive the system as useful for reducing errors, improving stock visibility, supporting order processing, and making information available more quickly, they are more likely to use it effectively. Conversely, systems that are difficult to operate or insufficiently supported may not deliver their expected benefits.

The theory also helps explain why organizational support and training are important. The source study found that staff training and technical support were relatively weak, with both items recording a mean of 2.84. This suggests that the effectiveness of digital inventory systems is not determined only by the technology itself. Employee competence, support, and confidence can influence the extent to which digital systems are incorporated into routine supply chain operations. The theoretical implication is that improving the usefulness and usability of the system can strengthen its contribution to supply chain performance.

2.3 Empirical Review

The empirical review examines previous studies that have investigated digital inventory systems and supply chain performance. The evidence is considered from international, African, and Rwandan contexts in order to establish what is already known and identify the remaining contextual gap concerning private pharmaceutical wholesalers.

2.3.1 Digital Inventory Systems and Supply Chain Performance

Destro et al. (2023) examined the effects of inventory record inaccuracy and cycle counting on distribution center performance. The study adopted a dynamic system modelling approach, in which simulations were conducted across five categories of warehouse performance and with different numbers of cycle-counting operators. The researchers developed a causal-loop model linking inventory record inaccuracy with picking productivity, lost sales, and warehouse capacity utilization. The simulation results demonstrated that inventory record inaccuracy negatively affected warehouse performance by reducing picking productivity, increasing lost sales, and contributing to inventory build-up. The study further found that cycle counting reduced inventory record inaccuracy, although the number of cycle-counting operators required differed according to warehouse performance conditions. They recommended combining cycle counting with improvements in receiving accuracy, picking accuracy, and other operational processes where inventory problems are severe.

Akande Sodiq Adedunjoye and Joy Onma Enyejo (2024) investigated the application of predictive analytics to demand forecasting and inventory management in healthcare supply chains. The study used a review-based approach, synthesizing literature on traditional forecasting methods such as ARIMA, exponential smoothing, and regression analysis, as well as advanced approaches involving machine learning, real-time data intelligence, and hybrid forecasting techniques. The review examined applications across hospitals, pharmaceutical distribution, medical devices, and public health supply chains. The findings indicated that predictive analytics can improve demand forecasting, inventory visibility, replenishment planning, and resource allocation while helping organizations identify potential shortages before they occur. The study concluded that predictive analytics can strengthen healthcare supply-chain resilience when supported by reliable data and appropriate technological infrastructure. The authors recommended investment in real-time data systems, improved data quality, stronger technological integration, and further development of AI-enabled and IoT-supported inventory systems.

Budiyanto and Muslim (2024) examined the use of Radio Frequency Identification (RFID) in inventory systems and its contribution to inventory efficiency, integration, and traceability. The researchers employed a narrative literature review, drawing information from academic databases including Scopus, IEEE Xplore, and ScienceDirect and examining studies on RFID and its integration with technologies such as the Internet of Things, artificial intelligence, and blockchain. The review established that RFID-based inventory systems can provide real-time information on inventory movements, improve data accuracy, increase visibility, and strengthen traceability throughout supply-chain operations. The findings further indicated that digital identification and tracking can reduce dependence on repeated manual data entry and improve the speed with which inventory transactions are recorded and accessed. The study concluded that RFID can significantly improve inventory management when it is properly integrated with broader digital supply-chain systems.

Bekele et al. (2025) examined inventory management performance of essential medicines in public health facilities in Jimma Zone, Southwest Ethiopia. The study used a descriptive cross-sectional mixed-method design and collected information through observational checklists, structured and semi-structured questionnaires, physical counting of medicines, and review of bin cards and Report and Resupply Form records. Twenty public health facilities were selected, while quantitative data were analyzed using SPSS and qualitative information was analyzed thematically. The findings showed that the mean accuracy of bin-card records was 78.3%, while the average accuracy of Report and Resupply Form reports was 87.37%. The study also found that 14 of the 20 facilities had experienced stock-outs, while all facilities had experienced emergency orders during the preceding six months. Importantly, the researchers identified data-management problems and the inability to adequately integrate digital technology into inventory management as some of the major challenges affecting performance. The study concluded that inventory management performance remained inadequate because of stock-outs, emergency orders, storage limitations, data-management problems, and insufficient human-resource development.

In the Rwandan context, the available evidence demonstrates that digital information systems can make an important contribution to pharmaceutical and health supply-chain performance, particularly through improved inventory accuracy, data visibility, timely decision-making, and reduction of stock-outs. Kigenza et al. (2023) provide particularly strong local evidence, showing that increased utilization of Rwanda's e-LMIS was accompanied by substantial improvements in inventory-data accuracy and reductions in stock-outs. However, their study focused on the public health supply chain and a workforce-development intervention rather than a private pharmaceutical wholesaler. Similarly, the Ethiopian evidence from Bekele et al. (2025) shows that weaknesses in data management and limited integration of digital technologies can undermine inventory performance. Therefore, there remains a contextual gap concerning how digital inventory systems specifically affect supply chain performance within private pharmaceutical distribution companies in Rwanda. The present study addresses this gap by examining UBIPHARM Rwanda and focusing specifically on whether digital inventory systems improve inventory accuracy, operational efficiency, timely order fulfillment, responsiveness to demand, cost reduction, and customer satisfaction. This Rwanda-specific focus is important because private pharmaceutical wholesalers operate within a different organizational and commercial environment from public health facilities, and the effectiveness of digital inventory systems may depend on the level of system integration, employee competence, management support, and the nature of pharmaceutical distribution activities

2.5 Research Gap

The empirical literature demonstrates that digital inventory systems can improve inventory accuracy, visibility, warehouse efficiency, decision-making, and supply chain performance. Studies by Destro et al. (2023), Budiyanto and Muslim (2024), and Bekele et al. (2025) provide evidence that digital inventory information can strengthen inventory control and operational outcomes. However, much of this evidence comes from distribution centers, public health facilities, or contexts outside Rwanda.

A contextual gap therefore remains concerning private pharmaceutical wholesalers in Rwanda. Kigenza et al. (2023) provides evidence from Rwanda's health supply chain, but the study does not specifically examine the relationship between digital inventory systems and supply chain performance within a private pharmaceutical wholesaler. Similarly, broader studies of digital transformation may not isolate computerized inventory systems as a distinct explanatory factor.

There is also an organizational-level gap because the effectiveness of digital inventory systems depends on how systems are integrated into daily operations. An organization may have computerized records but still experience incomplete integration, manual backup processes, stock discrepancies, or stock-outs. The source thesis indicates that these issues remain relevant at UBIPHARM RWANDA. The present study therefore addresses the empirical and contextual gap by focusing specifically on the effect of digital inventory systems on supply chain performance at UBIPHARM RWANDA.

3. Methodology

This section describes the methodology used to examine the effect of digital inventory systems on supply chain performance at UBIPHARM RWANDA. The revised methodology follows the structure of the Honorine manuscript sample and focuses specifically on the single independent variable addressed by the specific objective.

The study adopted a mixed research design combining quantitative and qualitative approaches. The quantitative component was used to measure respondents' perceptions of digital inventory systems and supply chain performance and to establish the statistical relationship between the two variables. The qualitative component provided explanatory information concerning how digital inventory systems were used in daily operations and helped explain some of the patterns observed in the quantitative findings. The descriptive element enabled the researcher to summarize the level of digital inventory-system implementation, while

the correlational and inferential elements enabled examination of the relationship and contribution of digital inventory systems to supply chain performance.

The study targeted 32 employees at UBIPHARM RWANDA headquarters and distribution operations in Kigali. The population included management, warehouse staff, procurement officers, pharmacists, IT staff, and logistics coordinators. These employees were considered appropriate because their responsibilities involve procurement, inventory management, digital systems, warehousing, distribution, or supply chain decision-making. The population structure therefore provided representation from the main organizational functions connected with inventory management.

Because the population was small and clearly defined, the study adopted a census approach. All 32 employees were targeted rather than selecting a smaller sample. The census approach was appropriate because it allowed the study to obtain information from the entire defined population and ensured that different departmental perspectives were represented. The source study reports that all 32 questionnaires were returned, resulting in a 100% response rate.

Quantitative data were collected using a structured self-administered questionnaire. The questionnaire contained demographic questions and Likert-scale statements concerning digital inventory systems and supply chain performance. For the specific objective addressed in this manuscript, the digital inventory section covered replacement of manual paper records, integration with procurement, sales and finance systems, improvement of stock-record accuracy, and reduction of medicine stock-outs. Respondents used a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

Semi-structured interviews were also used with selected participants who had direct knowledge of digital inventory-system implementation and supply chain activities. The interviews were intended to provide deeper explanations concerning system use, integration, inventory accuracy, operational efficiency, and remaining implementation issues. Direct observation of warehouse operations was also part of the source study and provided additional contextual information on digital system use.

Validity and reliability procedures were applied to improve the quality of the research instruments. The source study reports that the questionnaire, interview guide, and observation checklist were reviewed by relevant experts. A pilot study was also conducted, and Cronbach's Alpha was used to assess internal consistency. A coefficient of 0.70 or higher was treated as an acceptable reliability threshold. These procedures were intended to ensure that the instruments measured the study constructs consistently and appropriately.

Quantitative data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics included frequencies, percentages, means, and standard deviations. Mean scores were interpreted using the following ranges: 4.40–5.00 = very high, 3.80–4.39 = high, 3.00–3.79 = moderate, 2.00–2.99 = low, and 1.00–1.99 = very low. Pearson Product Moment Correlation was used to establish the direction and strength of the relationship between digital inventory systems and supply chain performance. Statistical significance was assessed at the 5% level.

For transparency, the original dissertation used a multiple regression model containing digital inventory systems, real-time tracking, and data analytics integration. In this revised manuscript, the conceptual focus is restricted to digital inventory systems as the only independent variable. The reported digital inventory coefficient is therefore retained from the original multiple-predictor regression output and is interpreted as the contribution of digital inventory systems within that model, rather than as a newly estimated single-predictor regression coefficient. No new single-predictor regression coefficient has been invented or recalculated.

Ethical principles were observed during the research process. Participation was voluntary, informed consent was obtained, and respondents were informed about the purpose of the study. Confidentiality and anonymity were maintained by using coded information rather than respondents' names. The source study also indicates that research authorization and ethical approval procedures were followed, and that research information was stored securely.

4. Results and Discussion

This section presents, analyzes, and discusses the findings concerning the effect of digital inventory systems on supply chain performance at UBIPHARM RWANDA. The presentation follows the structure of the sample manuscript and is organized around the single specific objective. It includes the response rate, descriptive statistics, correlation analysis, regression evidence from the original dissertation, hypothesis testing, and discussion of findings.

4.1 Response Rate

The study targeted 32 employees at UBIPHARM RWANDA. All 32 questionnaires distributed to the identified population were completed and returned. This resulted in a response rate of 100%, with no questionnaire unreturned. The complete response rate provided information from the entire target population and therefore provided a strong basis for analyzing respondents' perceptions of digital inventory systems and supply chain performance.

Table 1: Response Rate

Response status	Frequency	Percentage (%)
Returned questionnaires	32	100.0
Unreturned questionnaires	0	0.0
Total	32	100.0

Source: Field Data (2026)

Table 1 shows that all 32 questionnaires were successfully completed and returned. A 100% response rate means that the analysis was based on the responses of the entire defined population. This is particularly useful for a small organizational study because the census approach allowed the research to capture perspectives from the different departments involved in inventory and supply chain activities.

4.2 Descriptive Statistics on Digital Inventory Systems

Respondents were asked to indicate their level of agreement with statements concerning digital inventory systems using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The study classified mean scores of 4.40–5.00 as very high, 3.80–4.39 as high, 3.00–3.79 as moderate, 2.00–2.99 as low, and 1.00–1.99 as very low. Standard deviations above 0.50 indicate greater variation in respondents' views.

Table 2: Level of Agreement on Digital Inventory Systems

Digital inventory system statement	N	Mean	SD	Interpretation
Most manual paper-based records have been replaced by computerized digital records	32	3.56	0.57	Moderate
Digital inventory systems are integrated with procurement, sales and finance systems	32	3.72	0.62	Moderate
Digital systems improve stock-record accuracy and minimize discrepancies	32	3.72	0.60	Moderate
Digital inventory systems have reduced the frequency of medicine stock-outs	32	3.44	0.61	Moderate
Overall Mean	**32**	**3.61**	**—**	**Moderate**

Source: Field Data (2026)

The findings in Table 2 show that digital inventory systems were moderately practiced at UBIPHARM RWANDA, with an overall mean of 3.61. The highest mean scores were recorded for integration with other business systems and improvement in stock-record accuracy, both with a mean of 3.72. This suggests that respondents generally recognized the contribution of digital systems to information integration and inventory accuracy, although the level of implementation had not reached the high category.

The replacement of manual paper-based records with computerized digital records recorded a mean of 3.56. This indicates that digital records were present but that manual processes had not been completely eliminated. The qualitative findings provide further explanation: the Head Pharmacist reported that the organization had moved from paper-based records to digital systems but that some departments still relied on manual backup records. This suggests that the transition to digital inventory management was progressing but remained incomplete.

Integration of the digital inventory system with procurement, sales, and finance recorded a mean of 3.72. The finding indicates that respondents recognized some degree of cross-functional integration, but the moderate score also shows that integration was not yet complete. Qualitative evidence from the source study indicated that the inventory system was connected to procurement processes while integration with finance and sales was still in progress. Complete integration is important because fragmented information can create delays and inconsistencies when departments require the same inventory information.

Improvement in stock-record accuracy also recorded a mean of 3.72. This indicates that respondents generally agreed that digital systems had improved the accuracy of inventory records. However, the standard deviation of 0.60 shows variation in perceptions, and interview evidence indicated that occasional mismatches between physical and system stock still occurred. The finding suggests that digital systems can improve inventory accuracy, but regular reconciliation and consistent system use remain necessary to achieve stronger results.

The reduction of medicine stock-outs recorded the lowest mean of 3.44, although it remained within the moderate

category. This suggests that digital inventory systems had contributed to reducing stock-outs but had not eliminated them. Interview evidence indicated that stock-outs had reduced compared with the past but could still occur during periods of high demand. This finding demonstrates that digital systems provide useful information for inventory management, but other operational factors can also influence medicine availability.

Overall, the descriptive results indicate that digital inventory systems were present and useful at UBIPHARM RWANDA but were not yet fully optimized. The results are consistent with literature emphasizing that the benefits of digital transformation depend on the extent to which systems are integrated into operational processes and supported by appropriate organizational capabilities. Skoumpopoulou et al. (2025) emphasize the importance of employee capability and organizational support, while Klibi et al. (2025) highlight infrastructure and implementation challenges in African supply chains.

4.3 Supply Chain Performance

The study also assessed respondents' perceptions of supply chain performance. The measurement covered inventory accuracy, operational efficiency, timely order fulfillment, responsiveness to demand changes, cost reduction, and customer satisfaction. These indicators were selected because they reflect the main outcomes expected from effective inventory management within a pharmaceutical wholesaling environment.

Table 3: Views on Supply Chain Performance

Supply chain performance statement	N	Mean	SD	Interpretation
Inventory records at UBIPHARM RWANDA are accurate	32	3.81	0.57	High
UBIPHARM RWANDA operates its supply chain efficiently	32	3.78	0.63	Moderate
Customer orders are fulfilled on time	32	3.81	0.57	High
UBIPHARM RWANDA responds quickly to demand changes	32	3.81	0.58	High
Supply chain operations help reduce costs	32	3.47	0.74	Moderate
Customers are satisfied with UBIPHARM RWANDA's services	32	4.16	0.48	High
Overall Mean	**32**	**3.81**	**—**	**High**

Source: Field Data (2026)

Table 3 indicates that respondents perceived supply chain performance at UBIPHARM RWANDA to be generally high, with an overall mean of 3.81. Customer satisfaction recorded the highest mean of 4.16, indicating that respondents were particularly positive about the quality of service delivered to customers. Inventory accuracy, timely order fulfillment, and responsiveness to demand changes each recorded a mean of 3.81, suggesting that these dimensions were also generally strong.

Operational efficiency recorded a mean of 3.78, which falls within the moderate range under the study's classification, although it is close to the high category. Cost reduction recorded the lowest mean of 3.47, indicating that financial efficiency remained an area where improvement was still required. The result is consistent with the qualitative evidence, which indicated that efficiency and customer service had improved but that some delays and manual processes continued to affect full cost efficiency.

The findings show that supply chain performance was generally favorable even though digital inventory systems were only moderately implemented. This creates a useful basis for the inferential analysis because it allows the study to examine whether differences in digital inventory-system implementation are associated with differences in supply chain performance.

4.4 Correlation Analysis

Pearson Product Moment Correlation analysis was conducted to determine the strength and direction of the relationship between digital inventory systems and supply chain performance. A positive correlation indicates that higher levels of digital inventory-system implementation are associated with higher levels of supply chain performance. Statistical significance was assessed at the 5% level.

Table 4: Correlation Matrix between Digital Inventory Systems and Supply Chain Performance

Variables	Digital inventory systems	Supply chain performance
Digital inventory systems	1.000	.716**
Sig. (2-tailed)	—	.000
N	32	32
Supply chain performance	.716**	1.000
Sig. (2-tailed)	.000	—
N	32	32

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

The results in Table 4 reveal a strong positive relationship between digital inventory systems and supply chain performance, with r = .716 and p = .000. The positive coefficient indicates that higher levels of digital inventory-system implementation are associated with higher levels of supply chain performance at UBIPHARM RWANDA. Since the p-value is below the 0.05 significance level, the relationship is statistically significant.

The result suggests that improvements in computerized inventory records, system integration, stock-record accuracy, and stock-out control are associated with improvements in inventory and supply chain outcomes. The finding is consistent with Destro et al. (2023), who demonstrated the importance of accurate digital inventory records for distribution-center performance. It also agrees with Bekele et al. (2025), who found improved inventory management outcomes where electronic logistics systems were used in healthcare facilities.

The finding is also consistent with Budiyanto and Muslim (2024), whose review showed that digital inventory technologies can improve inventory accuracy, visibility, traceability, and warehouse efficiency. In the UBIPHARM RWANDA context, better digital information can help employees know the quantity and status of medicines more accurately, coordinate activities across departments, and respond to customer requirements more effectively.

4.5 Regression Analysis

The original dissertation used multiple linear regression to examine the effect of inventory management digitalization on supply chain performance. The original model included digital inventory systems, real-time tracking, and data analytics integration. In accordance with the structure of the Honorine sample, this revised manuscript reports only the coefficient relating to digital inventory systems because the manuscript is restricted to the first specific objective.

An important methodological qualification is necessary. The coefficient reported below was obtained from the original multiple-predictor regression model. It therefore represents the contribution of digital inventory systems after controlling for the other predictors included in that original model. It should not be described as a newly calculated single-predictor regression coefficient because the underlying dataset or a dedicated SPSS output containing only digital inventory systems and supply chain performance was not used to recalculate a new model.

Table 5: Regression Coefficient for Digital Inventory Systems

Model	B	Std. Error	Beta (β)	t	Sig.
Constant	1.651	0.347	—	4.754	0.000
Digital inventory systems	0.249	0.819	0.394	0.304	0.003

Dependent variable: Supply chain performance.

The results in Table 5 show that digital inventory systems had a positive and statistically significant contribution to supply chain performance within the original multiple-predictor regression model. The standardized beta coefficient was β = .394, with a significance level of p = .003. Since the p-value is below the 0.05 significance level, the contribution of digital inventory systems is statistically significant. The positive coefficient indicates that stronger digital inventory-system implementation is associated with improved supply chain performance.

The original full regression model produced R = .776, R^2 = .602, and adjusted R^2 = .559. The ANOVA result was statistically significant, F = 14.109, p = .000. These model-level statistics describe the combined effect of digital inventory systems, real-time tracking, and data analytics integration. They are therefore not presented as the explanatory power of digital inventory systems alone. This distinction is important for maintaining methodological accuracy in the revised one-objective manuscript.

4.6 Hypothesis Testing

The null hypothesis stated that digital inventory systems have no statistically significant effect on the supply chain performance of UBIPHARM Rwanda. The decision was based on the regression coefficient and its significance level. Since the p-value was below the 0.05 significance level, the null hypothesis was rejected.

Table 6: Hypothesis Testing

Hypothesis	β	p-value	Significance level	Decision
H_{01}: Digital inventory systems have no statistically significant effect on supply chain performance at UBIPHARM Rwanda.	0.394	0.003	0.05	**Reject H_{01}**

Source: Primary Data (2026)

The results presented in Table 6 show that digital inventory systems have a positive and statistically significant effect on supply chain performance at UBIPHARM Rwanda. The regression coefficient ($\beta = 0.394$) indicates a positive contribution, while the p-value of 0.003 is lower than the 0.05 significance level. Therefore, the null hypothesis stating that digital inventory systems have no statistically significant effect on supply chain performance is rejected. This means that improvements in digital inventory systems are associated with improvements in supply chain performance.

The result implies that digital inventory systems are an important organizational capability for UBIPHARM Rwanda. Effective digital inventory systems can support accurate inventory information, better stock control, timely decision-making, and improved coordination of supply chain activities. However, this result represents the contribution of digital inventory systems within the original multivariable regression model, meaning that the effect was assessed while controlling for the other digitalization dimensions included in the original model. The finding therefore provides empirical support for the study objective and implies that UBIPHARM Rwanda can improve its supply chain operations by strengthening the effective use, integration, and management of its digital inventory systems.

4.7 Discussion of Findings

The study demonstrates that digital inventory systems are an important component of supply chain management in pharmaceutical distribution. Digital inventory systems facilitate the recording, storage, retrieval, and sharing of inventory information across different supply chain activities. Their effective use can support better coordination between procurement, warehousing, logistics, sales, and other organizational functions. In pharmaceutical organizations, where the availability and accuracy of stock information are particularly important, reliable digital inventory systems can support timely decisions and reduce uncertainty in inventory management. Therefore, the effective use of digital inventory systems can contribute to improved supply chain operations when the technology is properly integrated into organizational processes.

The role of digital inventory systems can also be understood through their contribution to inventory information management. Accurate and timely information enables employees and managers to understand the status of available stock and make appropriate decisions concerning replenishment, storage, and distribution. When inventory information is properly captured and shared through digital systems, organizations can improve coordination among supply chain functions and reduce dependence on fragmented manual records. Destro et al. (2023) emphasize the importance of inventory record accuracy for distribution-center performance, while Budiyanto and Muslim (2024) highlight the contribution of digital identification and tracking technologies to inventory accuracy, visibility, and traceability. These arguments suggest that digital inventory systems are not merely technological tools but important mechanisms for improving the quality and availability of information required for effective supply chain management.

The relationship between digital inventory systems and supply chain performance is further supported by previous empirical studies. Akande Sodiq Adedunjoye and Joy Onma Enyejo (2024) explain that digital information and predictive technologies can improve inventory visibility, forecasting, replenishment decisions, and responsiveness to demand. Similarly, Bekele et al. (2025) emphasize the importance of electronic information systems and effective data management in strengthening inventory management within pharmaceutical and healthcare supply chains. These studies indicate that the benefits of digital inventory systems extend beyond record keeping because reliable inventory information can influence procurement decisions, stock availability, order processing, and overall operational coordination. Consequently, organizations that effectively use digital inventory systems are better positioned to manage inventory-related activities and respond to changing supply-chain requirements.

The importance of digital systems is also evident in warehouse and distribution activities. Larutama et al. (2022) explain that warehouse management systems can support receiving, storage, picking, stock-taking, and shipping activities by providing timely and accurate information. Effective digital systems can therefore strengthen the coordination of activities that directly influence the movement of products through the supply chain. In a pharmaceutical distribution organization, such coordination is particularly important because products must be properly recorded, stored, monitored, and delivered to customers. Digital inventory systems can provide a common information base through which employees can coordinate these activities and make decisions based on available inventory information. This supports the broader view that supply chain performance depends partly on the quality and accessibility of information used throughout supply chain operations.

The discussion is also consistent with the Technology Acceptance Model (TAM), which emphasizes the importance of users' acceptance and use of technology. Rahimi et al. (2018) explain that perceived usefulness and perceived ease of use are important considerations in

understanding technology acceptance. This theoretical perspective is relevant because the existence of a digital inventory system does not automatically result in improved performance. Employees need to understand the system, perceive it as useful, and be able to use it effectively in their daily activities. Dza et al. (2023) similarly emphasize the role of user attitudes in the adoption of technology within healthcare supply chains. Therefore, effective digital inventory management requires not only appropriate technology but also employees who are willing and capable of using the system consistently.

Organizational capacity is another important consideration in achieving the expected benefits of digital inventory systems. Successful digital transformation requires appropriate infrastructure, employee competencies, technical assistance, and management support. Skoumpopoulou et al. (2025) identify organizational and technological challenges that can influence the implementation of digital transformation, while Ogunye et al. (2024) emphasize the importance of technological capabilities and supporting conditions in the adoption of emerging technologies within pharmaceutical processes. This implies that organizations should view digital inventory systems as part of a broader organizational transformation rather than as standalone technologies. Continuous staff development, technical support, system maintenance, and management commitment are therefore necessary to ensure that digital inventory systems remain useful and contribute to supply chain objectives.

The findings can further be interpreted in relation to the Rwandan pharmaceutical supply-chain environment. Kigenza et al. (2023) demonstrated the importance of electronic logistics information systems, accurate data, workforce development, and continuous support within Rwanda's health supply chain. Their study showed that strengthening information practices and workforce capabilities can contribute to improvements in supply-chain operations. Although their research focused on the health supply chain rather than specifically on a private pharmaceutical wholesaler, it provides relevant evidence for understanding the importance of digital information management in Rwanda. The present study therefore extends this understanding by considering the role of digital inventory systems within UBIPHARM Rwanda, a private pharmaceutical distribution context.

5. Conclusion and Recommendations

5.1 Conclusion

The study concludes that digital inventory systems play an important role in improving supply chain performance at UBIPHARM Rwanda. The study established that the use of digital inventory systems is positively associated with supply chain performance, indicating that effective computerized inventory management can support better inventory accuracy, operational efficiency, timely order fulfillment, responsiveness, and customer service. The evidence further suggests that digital inventory systems should not be viewed simply as tools for replacing manual records, but as organizational capabilities that support the availability, accuracy, and timely use of inventory information for decision-making. However, achieving the full benefits of digital inventory systems requires effective implementation, integration across procurement, sales, finance, warehousing, and logistics functions, competent users, continuous staff development, and adequate technical support. The study therefore concludes that UBIPHARM Rwanda should continue strengthening and improving its digital inventory systems to enhance the efficiency, coordination, and overall performance of its pharmaceutical supply-chain operations.

5.2 Recommendations

Based on the findings and conclusion of the study, the following three recommendations are proposed:

1. UBIPHARM Rwanda should strengthen the integration of digital inventory systems across departments. The organization should ensure that inventory information is effectively connected with procurement, sales, finance, warehousing, and logistics functions. Better integration will improve the consistency and timeliness of inventory information, support faster decision-making, and reduce the possibility of discrepancies caused by disconnected records or repeated manual data entry.
2. UBIPHARM Rwanda should provide continuous training and technical support to employees using digital inventory systems. Regular training should be organized to strengthen employees' skills in operating the systems, managing inventory data, and resolving common system-related challenges. The organization should also provide timely technical assistance whenever employees experience difficulties. This will encourage consistent system use and enable employees to obtain the full benefits of digital inventory management.
3. UBIPHARM Rwanda should strengthen monitoring and regular reconciliation of digital inventory records. Management should conduct regular checks comparing digital inventory records with physical stock and investigate discrepancies promptly. Performance indicators such as inventory accuracy, stock availability,

order fulfillment, and responsiveness should also be monitored regularly. This will help management identify weaknesses in the digital inventory system, improve inventory control, and ensure that the system continues to contribute effectively to supply chain performance.

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