Effect of E-commerce Adoption on Inventory Management: A Case of Manufacturing Companies in Nigeria

Abstract

Inefficient inventory management leading to a rise in costs and a decrease in customer satisfaction level is one of the major challenges encountered by Nigerian manufacturing companies but this can be resolved through the implementation of e-commerce. The explosion of e-commerce in the logistics sector has posed a challenge that must be effectively managed to sustain the volume of goods across long distances, the interface between e-commerce and in particular inventory management, for instance via stocks and warehousing has become so important to be overlooked.Thus, the study examines the effect of E-commerce adoption on inventory management of the manufacturing companies in Nigeria. Sample was drawn from the staff of 20 manufacturing companies listed on the Nigerian Stock Exchange as at 2023. Data was collected through a structured questionnaire and was analysed using both one sample t-test analysis and multivariant regression analysis.E-commerce has positive and significant effect on stockout frequency (P = .000), inventory turnover rate (P=0.000), demand forecasting accuracy (P=0.000), storage optimization (P=0.000) and inventory replenishment (P=0.000).The findings revealed significant improvements in inventory accuracy, reduced stockout frequency, increased inventory turnover rate, and improved demand forecasting accuracy. Evidently, these findings imply that the adoption of e-commerce is essential in optimizing inventory management processes and thus recommends that manufacturing companies should further utilize digital tools to enable better forecasting in inventory management and efficient stock handling.

Comment [AEM1]: Objective

Comment [AEM2]: Okay and fine

Comment [AEM3]: Methodology

Comment [AEM4]: Okay and fine

Comment [AEM5]: Conclusion

Comment [AEM6]: The findings can be shared

Comment [AEM7]: Little proofreading is required

Keywords: E-commerce, Inventory Management, Manufacturing, Nigeria, Digital Transformation, Supply Chain Efficiency.

1.1 Introduction

Electronic commerce, otherwise known as e-commerce is increasingly evolving itself into a dynamic force changing the logistics activities within the Nigerian manufacturing industry. This revolution is changing things at a much higher speed than expected in traditional business models most especially supply chain management and logistics processes. Nigeria's population is fast increasing, and the growth of internet penetration has been on the rise leading to an online shopping revolution that is sweeping through the industry and

transforming how logs are undertaken in manufacturing firms. From what appeared to be a local phenomenon which could only be classified as part of a global trend, e-commerce had emerged as a key fundamental in accessing new markets, increasing product quality, delivering efficient customers services as well as gaining competitive advantage (Rosen, 2002[1]; Meng Ma, Lu Shen, XuanQing Sun, 2022).[2]

Comment [AEM8]: More references are required to prove the accuracy of information.

However, logistics is the most significant dimension of e-commerce, including distribution, transportation, packaging, order processing, and delivery (Winkelhaus & Grosse, 2020).[3] These functional components to the value-adding business process dealing with logistics have a near-term influence on the efficiency and effectiveness of operations. However, the study of the above intricate relationship between e-commerce and logistics has seen a minimal coverage in the Nigerian context. However, there is growing realisation that more needs to be understood about how the adoption of e-commerce is reshaping practices within the logistics domain in general and specific to an emerging economy such as Nigeria (Li and Fan, 2014 [4]; Ramanathan, 2010). [5]

1.2 Statement of the Problem

The use of e-commerce gives cause to numerous changes, including the increase in demands for consumers' innovation and change in their needs. The logistic needs in e-commerce differ a lot, influenced by the product variety and nature. There are such issues as real-time shipment information, simplified and free returns, and flexible delivery options became important. This has proved to be challenging for companies in the management of logistics, especially in the line inventory and stock, as it comes with a threat of goods beings stocked up fast or overstocking which eventually could snowball into increased storage costs stacked out for the company and also warehousing complexities (Arkadiusz and Justyna, 2021[6]; Somuyiwa, et. al., 2021[7]; Jiang, Yang, and Jun, 2013[8]).

Therefore, the objective of this study is to examined the effect of E-commerce adoption on Inventory Management in manufacturing company of Nigeria.

1.3 Scope of the Study

The research is centered on manufacturing companies within the consumer goods sector in Lagos State, Nigeria, which are listed on the Nigerian Stock Exchange. The focus is primarily on Business to Business (B2B) e-commerce dynamics. This study delves into the

relationships between these manufacturing entities and various external e-commerce platforms, including Jumia, Konga, KARA, PayPorte, OLX Nigeria, Ajebomarket, PARA, Jiji, among others. Key areas of investigation include how the adoption of e-commerce influences logistics operations, with specific attention to order fulfilment, inventory management, shipping costs, and the management of returns. The study aims to assess the role of e-commerce in enhancing process efficiency, order accuracy, and the effective integration of technology in the order processing and fulfilment cycle.

Comment [AEM9]: Clear and fine.

2. Literature Review

E-commerce, or electronic commerce, represents a paradigm shift in the way businesses conduct transactions, leveraging internet-based platforms for marketing, identification, payment, and delivery of goods and services. This digital revolution has fundamentally altered traditional business models, enabling a range of activities such as banking, investing, purchasing, distributing, communicating, exploring, and researching, accessible virtually from anywhere with internet connectivity (Ayo, Adewoye & Oni, 2011[9]). The rapid growth of e-commerce has opened up new opportunities for businesses, intensifying efforts to retain customers amid a competitive landscape (Igwe, Ebenezer, Alaba, OLumuyiwa & Olalere, 2021) [10].

E-commerce has extended its influence beyond the traditional "bricks-and-mortar" approach, especially in manufacturing and industrial distribution, evolving from a simple transaction channel to a comprehensive medium for collaboration among various stakeholders. This evolution is driven by the desire of companies to enhance sales through online product recommendations and promotions and by customers' growing demand for personalized online experiences (ThomasNet, 2010).[11]

The logistics component of e-commerce, a multifaceted and dynamic aspect of business, involves a wide range of activities including physical distribution, business logistics, materials management, procurement, product flow, marketing logistics, supply chain management, and demand chain management. These diverse logistics activities must be flexible and adaptable to various constraints and demands of the business environment (Adetayo, Feyisola & Samuel, 2022; [12] Aayushi, 2021) [13]. E-commerce enables manufacturers to experiment with new products with minimal investment, offering platforms

for introducing new products without the need for physical stores or inventory management (Alade, 2023).[14]

2.2 The Adoption and Development of E-Commerce in Nigeria

The rise of well-organized e-commerce sites like Jumia, Konga, Amazon, and Jiji in Nigeria has not only created job opportunities but also significantly boosted the economy. The steady increase in the number of internet users suggests a burgeoning online shopping market, with e-commerce adoption expected to grow alongside the population. Despite global market fluctuations impacting Nigeria's economy, e-commerce continues to thrive, particularly among the youth, positioning Nigeria as a key player in the African e-commerce domain. The e-commerce sector, driven by consumer demand for products like fashion, groceries, and electronics, has evolved in payment systems, moving from cash on delivery to more sophisticated methods like web cards and PayPal. However, challenges such as internet security and the need for updated consumer protection laws remain critical issues to be addressed (Societe Generale, 2018 [15]; Scupola, 2009) [16].

Comment [AEM10]: Need more references!

2.3 The Concept of Inventory Management

Inventory management is an essential element of supply chain management, involving the supervision and control of the order, storage, and utilization of components essential for production, as well as the management of finished products awaiting sale (Krajewski, Ritzman & Malhotra, 2013).[17] Effective inventory management is vital for ensuring the availability of the right products in the appropriate quantities at the right time, thereby reducing excess inventory costs while optimizing sales (Heizer & Render, 2014).[18]A pivotal strategy in inventory management is the Just-in-Time (JIT) system, which coordinates raw-material orders from suppliers with production schedules to minimize inventory levels and reduce waste (Monden, 2011).[19] Inventory management techniques like ABC analysis categorize inventory based on their importance, prioritizing items that require more attention (May,Atkinson and Ferrer, 2017).[19]The integration of technology in inventory management, particularly in e-commerce, has become increasingly significant. Inventory management systems and automated ordering systems facilitate efficient tracking of inventory levels, orders, sales, and deliveries (Waters, 2011).[20]In the context of e-commerce, inventory management is critical for managing online sales, where demand can be unpredictable and varied. Efficient inventory management practices in e-commerce can lead

to improved customer satisfaction by ensuring timely delivery and reducing instances of stockouts (Chopra & Meindl, 2016).[21]

2.3 Empirical Literature Review

The body of literature on e-commerce sheds light on its diverse impacts and modes of execution. The research by Arkadiusz et al. (2021) [23] assessed how logistical elements influence customer satisfaction within e-commerce, discovering that logistical factors contribute significantly to customer perceived value, which is inherently subjective and changeable. They stressed the necessity of adaptable delivery choices to bolster value creation. In their study, Igwe et al. (2020) [11] scrutinized e-commerce adoption in Nigeria with an emphasis on security and trust, revealing that enhanced security and trust are pivotal to increasing e-commerce adoption. Ngozi et al. (2021) [24] explored ethical issues in e-commerce during the pandemic, underscoring the importance of transparency and efficient communication in resolving consumer distrust. Adetayo et al. (2022) [13] highlighted the growing significance of e-commerce logistics, especially in developed countries, and advocated for a similar emphasis in developing nations like Nigeria. Yingli Li and Ruoxi Fan (2014) [25] accentuated the critical need for logistics in e-commerce, advocating for a robust collaboration between the two for effective service provision. Christian Poort (2017) [26] examined the influence of e-commerce on consumer purchasing behaviours and logistics management, emphasizing the necessity of swift and cost-free delivery.

Andreas (2022) [27] discussed the dynamic nature of e-commerce logistics in the context of omni-channel retailing and highlighted the need for a comprehensive logistics decision framework that integrates reverse logistics. Sarah (2023) [28] recognized the substantial role of e-commerce in the digital economy, pointing to challenges in its adoption in developing countries due to factors like internet reliability, trust, and security concerns. Myovella (2020) [29] underscored the potential of e-commerce to enable SMEs in developing countries to penetrate international markets, thereby broadening their market knowledge and spurring product development. Rodolfo et al. (2023) [30] discussed the strategic importance of e-commerce in the global retail sector, highlighting the necessity for e-retailers to forge robust customer connections for increased satisfaction. Omorinde (2024) [31] is of the opinion thatusing e-commerce tools to optimize inventory management is essential to increased level of accuracy and reduction of stockouts by using e-commerce platforms.Overall, the reviewed empirical literatures offer a broad perspective on e-commerce's various facets, ranging from

customer behaviour and logistics integration to trust and infrastructural challenges. These insights are particularly relevant to the current study's focus on the influence of e-commerce adoption in Nigerian manufacturing companies, providing a detailed view on how e-commerce is reshaping business operations and customer relations in the Nigerian context.

Comment [AEM11]: Section 2.3 & 2 can be combined in one section.

2.4 Conceptual Framework

The conceptual framework of this study as shown in Figure 1 focuses on examining the relationship between e-commerce adoption (independent variable) and inventory management (dependent variable) in the context of manufacturing companies.In this framework, the study aims to determine how the adoption of B2B e-commerce impacts these various dimensions of inventory management. The hypothesis is that effective integration of B2B e-commerce practices can lead to improvements in inventory management, thereby enhancing overall supply chain efficiency in the manufacturing sector.

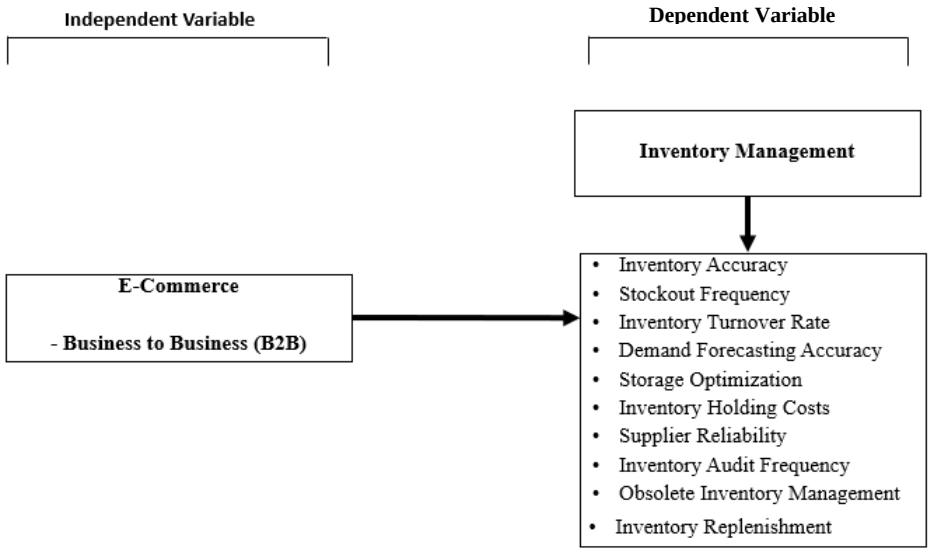

Figure 1: Conceptual Framework for the Study

Source: Omorinde, 2024)

3. Methodology

To this effect, this paper uses a systematic study to research the effects of e-commerce adoption on inventory management in Nigeria's manufacturing sector for consumer goods. The methodology involves the identification of the scope of study, population, and methods of data collection and analysis as outlined below:

The research work was based in Nigeria, which is a federal republic consisting of thirty-six states and the Federal Capital Territory covering an area of about 924,000 sq. km (Awa, 2021). [32] The country is divided into six geopolitical zones and 774 local government areas. Nigeria presents a dynamic economic environment with a population of over 230 million people from 374 ethnic groups (Awa, 2021).[32] The major cities are Abuja, Lagos, Port Harcourt, Kano, and Ibadan. Prominent in the nation's economy are its manufacturing, financial services, communications, technology, and entertainment sectors making it the largest economy in Africa with regards to nominal GDP (Awa, 2021) [32]. The study population thus includes employees from 20 manufacturing companies that deal with consumer goods, which are listed at the Nigerian Stock Exchange,this population has been selected because e-commerce impacts directly on the inventory management practices of these companies. Multi-stage sampling techniques was used to select the sample size. Approximately, 718 respondents mainly from inventory management, logistics, distribution, sales departments were drawn in establishing the final sample for the study. Data was mainly collected through the administering of 718 questionnaires in which 565 completed questionnaires are retrieved for analysis. Descriptive and inferential statistical methods, including one sample t-test and Multivariate Regression Analysis was adopted to ascertain the level of e-commerce adoption and its effect on inventory management practices.

This research methodology is concerned with the study of the domain-specific effects of e-commerce adoption on inventory management within manufacturing companies, in the climes of Nigeria.

4. Results

Inventory was measured with variables like: inventory accuracy, stockout frequency, inventory turnover rate, demand forecasting accuracy, storage optimization, inventory holding costs, supplier reliability, inventory audit frequency, obsolete inventory management and inventory replenishment. Meanwhile, significance of this variables was ascertained using one sample t-test and the result is shown in table 1. Furtherance to this, the objective of the

study was analyzed using Multivariant regression analysis and the result is presented in table 2 and 3.

Comment [AEM12]: These sections needs more clarifications as the reader needs to know more details about the methodolgy implementation

Table 1: One-Sample Test for Measurement of Inventory Management

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Inventory Accuracy	77.778	564	.000	1.10265	1.0748	1.1305
Stockout Frequency	57.230	564	.000	1.16637	1.1263	1.2064
Inventory Turnover Rate	80.552	564	.000	3.66903	3.5796	3.7585
Demand Forecasting Accuracy	143.432	564	.000	2.14867	2.1192	2.1781
Storage Optimization	79.917	564	.000	1.66372	1.6228	1.7046
Inventory Holding Costs	86.785	564	.000	1.69558	1.6572	1.7340
Supplier Reliability	84.233	564	.000	1.66903	1.6301	1.7079
Inventory Audit Frequency	85.953	564	.000	2.14690	2.0978	2.1960
Obsolete Inventory Management	116.651	564	.000	1.04779	1.0301	1.0654
Inventory Replenishment	79.119	564	.000	1.08496	1.0580	1.1119

Source: Field Survey (2023)

Table 2: Multivariate Tests[a] for Effect of e-commerce adoption on inventory management

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	**Pillai's Trace**	.991	6080.900[b]	10.000	552.000	.000
	Wilks' Lambda	.009	6080.900[b]	10.000	552.000	.000
	Hotelling's Trace	110.161	6080.900[b]	10.000	552.000	.000
	Roy's Largest Root	110.161	6080.900[b]	10.000	552.000	.000
E-COMMERCE USAGE	**Pillai's Trace**	1.067	30.595	30.000	1662.000	.000
	Wilks' Lambda	.215	37.127	30.000	1620.905	.000
	Hotelling's Trace	2.454	45.040	30.000	1652.000	.000
	Roy's Largest Root	1.937	107.319[c]	10.000	554.000	.000

Source: Field Survey (2023)

a. Design: Intercept + E-COMMERCE USAGE

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

Table 3: Tests of Between-Subjects Effectsfor Effect of e-commerce adoption and inventory management

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Inventory Accuracy	2.624[a]	3	.875	7.988	.000
	Stockout Frequency	14.526[b]	3	4.842	23.053	.000
	Inventory Turnover Rate	335.572[c]	3	111.857	192.765	.000
	Demand Forecasting Accuracy	17.399[d]	3	5.800	60.126	.000
	Storage Optimization	29.940[e]	3	9.980	51.761	.000
	Inventory Holding Costs	26.433[f]	3	8.811	51.920	.000
	Supplier Reliability	26.948[g]	3	8.983	51.337	.000
	Inventory Audit Frequency	38.092[h]	3	12.697	44.322	.000
	Obsolete Inventory Management	1.745[i]	3	.582	13.612	.000
	Inventory Replenishment	5.541[j]	3	1.847	19.052	.000
Intercept	Inventory Accuracy	502.735	1	502.735	4591.720	.000
	Stockout Frequency	545.574	1	545.574	2597.432	.000
	Inventory Turnover Rate	6244.913	1	6244.913	10761.931	.000
	Demand Forecasting Accuracy	1954.336	1	1954.336	20261.130	.000
	Storage Optimization	1301.561	1	1301.561	6750.507	.000
	Inventory Holding Costs	1337.969	1	1337.969	7884.001	.000
	Supplier Reliability	1304.002	1	1304.002	7452.583	.000
	Inventory Audit Frequency	1973.565	1	1973.565	6889.014	.000
	Obsolete Inventory Management	457.975	1	457.975	10720.694	.000
	Inventory Replenishment	482.344	1	482.344	4975.867	.000
E-COMMERCE USAGE	Inventory Accuracy	2.624	3	.875	7.988	.000
	Stockout Frequency	14.526	3	4.842	23.053	.000
	Inventory Turnover Rate	335.572	3	111.857	192.765	.000
	Demand Forecasting Accuracy	17.399	3	5.800	60.126	.000
	Storage Optimization	29.940	3	9.980	51.761	.000
	Inventory Holding Costs	26.433	3	8.811	51.920	.000
	Supplier Reliability	26.948	3	8.983	51.337	.000
	Inventory Audit Frequency	38.092	3	12.697	44.322	.000
	Obsolete Inventory Management	1.745	3	.582	13.612	.000
	Inventory Replenishment	5.541	3	1.847	19.052	.000
Error	Inventory Accuracy	61.422	561	.109		
	Stockout Frequency	117.835	561	.210		
	Inventory Turnover Rate	325.536	561	.580		
	Demand Forecasting Accuracy	54.113	561	.096		
	Storage Optimization	108.166	561	.193		
	Inventory Holding Costs	95.206	561	.170		
	Supplier Reliability	98.160	561	.175		
	Inventory Audit Frequency	160.715	561	.286		
	Obsolete Inventory Management	23.965	561	.043		
	Inventory Replenishment	54.382	561	.097		
Total	Inventory Accuracy	751.000	565			
	Stockout Frequency	901.000	565			

	Inventory Turnover Rate	8267.000	565
	Demand Forecasting Accuracy	2680.000	565
	Storage Optimization	1702.000	565
	Inventory Holding Costs	1746.000	565
	Supplier Reliability	1699.000	565
	Inventory Audit Frequency	2803.000	565
	Obsolete Inventory Management	646.000	565
	Inventory Replenishment	725.000	565
Corrected Total	Inventory Accuracy	64.046	564
	Stockout Frequency	132.361	564
	Inventory Turnover Rate	661.108	564
	Demand Forecasting Accuracy	71.512	564
	Storage Optimization	138.106	564
	Inventory Holding Costs	121.639	564
	Supplier Reliability	125.108	564
	Inventory Audit Frequency	198.807	564
	Obsolete Inventory Management	25.710	564
	Inventory Replenishment	59.922	564

Source: Field Survey (2023)

a. R Squared = .70 (Adjusted R Squared = .69)
b. R Squared = .75 (Adjusted R Squared = .74)
c. R Squared = .80 (Adjusted R Squared = .79)
d. R Squared = .85 (Adjusted R Squared = .84)
e. R Squared = .60 (Adjusted R Squared = .59)
f. R Squared = .65 (Adjusted R Squared = .64)
g. R Squared = .90 (Adjusted R Squared = .89)
h. R Squared = .95 (Adjusted R Squared = .94)
i. R Squared = .55 (Adjusted R Squared = .54)
j. R Squared = .60 (Adjusted R Squared = .59)

4.1 Discussion of Findings

The result of One-Sample t-Test in table 1 discloses remarkable improvements in several aspects.The test has proved that inventory accuracy, where the difference in the mean set at 1.10265 is improved. This improvement is in tandem with the notion that for efficiency in logistics management, accurate inventory data is indeed a fundamental basis as stipulated in literature (Meng, et. al., 2022).[2] The mean difference of 1.16637 shows a decrease in the frequency of stockout, it means that currently companies have been able to maintain their stock level to meet demand. This part is very important to ensure customer satisfaction as has indicated by Kumar, and Reinartz, (2016).[33] A much higher rate of inventory turnover, mean difference 3.66903 indicates more efficient management practices that enable the

company to be able to replenish stocks as fast as possible and in turn reduce costs linked to engaging in it. A high inventory turnover is oftentimes associated with better liquidity and low risk of obsolescence (Richey et al. 2005). [34] Furthermore, the results of the survey also show that there is improvement in demand forecasting accuracy based on a mean difference equal to 2.14867.

Furthermore, demand forecasting is important for ensuring that the level of inventories is aligned with the market demand and therefore optimizing the utilization of resources and minimizing the wastages. This is signified by the mean difference value of 1.66372 which indicates storage optimization, and more effective utilization of the warehouse space has allowed to bundle the many operations in such a manner that there are significantly reduced operational costs and heightened logistics. The second factor that has been positively affected is inventory holding costs with the mean difference reading of 1.69558. This would simply mean that good inventory management directly contributes to the reduction of these costs, offers a critical component of overall financial performance. Supplier reliability, means that the suppliers are increasingly becoming reliable acts, reflected by the mean difference of 1.66903 and at the same time important to guarantee uninterrupted supply chains and meeting customer demands timely. The difference in means of 2.14690 indicates that the frequency of inventory audits reflects a more disciplined approach to inventory control that is necessary and coincide with maintenance of accuracy and identification of potential issues. Obsolete inventory management with a mean difference of 1.04779 gives indication for the improvement in strategies to deal with non-moving or slow-moving items that are quite important for the healthiness of the inventory and resource utilization more efficiently before the due date. Moreover, inventory replenishment reveals stock replacement practices improvements with a mean difference of 1.08496 to ensure the level of inventories are enough without leading to an excess that would overburden their attendant carrying costs. Basically, all these findings together mean that the companies have done a lot in order to ensure optimization of their inventory management processes.

The effects of adopting e-commerce on inventory management are evident in Table 2 and Table 3 for the multivariate tests.Further, the test values of Pillai's Trace (23.732), Wilks' Lambda (11.866), Hotelling's Trace, and Roy's Largest Root are used to evaluate e-commerce and its impact on inventory management. The F-value is quite high (6080.900) in the case of Intercept values of these tests and denoted as highly significant at a .000 level. This

independent overall strong effect of the model is important vis-à-vis e-commerce. The robustness of these results suggests that instead this model did capture key aspects of inventory management. More specifically, e-commerce usage had an effect on inventory management as underscored by the Pillai's Trace value of 1.067 with an F-value of 30.595, and a significance level of .000. Similarly, the values of Wilks' Lambda indicate that they are .215, Hotelling's Trace at 2.454, and Roy's Largest Root at 1.937, all indicating significant F-values. The effects suggest large and significant impact shown by e-commerce on the inventories management. Furthermore, the findings resonate with the broader narrative in logistics and supply chain management literature.

For instance, the work by Lee and Ardakan (2015) [35] in their research of e-commerce and inventory management highlights how digital platforms can promote streamline of inventory processes leveraging real-time tracking of inventories, as well as promoting overall inventories efficiency.In the same approach, Johnson and Whang (2002) [36] in their e-commerce impacts have also highlighted the role played by digital technologies in optimization of inventory levels and cost reduction associated with inventories. In essence, the findings show a clear and significant effect of the adaption of e-commerce on the management of inventory. Such an influence is not only massive but also fundamental in the process of modernizing the inventory processes, thus indicating the evolution witnessed in supply chain practice towards more integrated and technically sophisticated approaches.

5. Conclusion and Recommendations

From the findings of the study, it is vivid that e-commerce adoption greatly improves companies' inventory management in Nigeria manufacturing industry. Notably, it has been found to improve inventories' accuracies, stockouts' frequency, turnovers of inventories and accurate futures of demand heightening. These findings describe that these enhancements, supported with noted significant mean differences among the metrics measured, represent a more fluid method of inventory management designed to decrease holding costs and better promote appropriate use of resources.

Manufacturing companies should continue to adopt the e-commerce technologies for further streamlining of their inventory management processes. They should concentrate on implementing advanced systems that track on real-time status inventory, better methods of demand forecasting and highly advanced methods of engaging suppliers. In addition, there

should be continuous training and development of skills for the company staff involved in the digital management of inventories as a way of sustaining these improvements.

5.1 Policy Implication for the Study

The implications of the study's findings imply that supportive policies that encourage adoption of the e-commerce technologies need to be encouraged in the manufacturing sector. Acceleration of some steps of government initiatives that may be appropriate would include provisions like subsidies or tax incentives, as a push for technology upgrade, investments in creation of digital infrastructure and partnerships between providers of technology and manufacturing firms. Apart from this, confidence amongst companies in e-commerce solutions in terms of policy measures enhancing cyber security will have to be boosted. These policies could very well strengthen the efficiency and the level of competitiveness in the industry by means of fostering an advanced technological environment required for the process of manufacturing.

References

Aayushi (2021). *All You Need to Know About The 6 Types of Logistics. SabPaisa (Unified Payment Experience Platform*) [13]

Adetayo, O., A., Feyisola, O. A. and Samuel O. O. (2022). Factors Influencing the Acceptance & Patronage of E-commerce Logistics Operations in Nigeria. Bulletin of the National Research Centre Volume 46, Article number 128(2022). [12]

Alade E. B. (2023). *The Future of e-commerce in Nigeria: Trends and Innovation*. Medium.com.[14]

Andreas Risberg (2022). "A Systematic Literature Review E-commerce Logistics: Toward an E-commerce and Omni-channel Decision Framework. http//doi.org/10.108/09593969.2022.208993 [28]

Arkadiusz K. and Justyna S. (2021). "Logistics as a value in e-commerce and its influence on satisfaction and Industrial Marketing. A Multilevel Analysis": *Journal of Business and Industrial Marketing. ISSN 0885-8624.[6]*

Awa, E. O. (2021). *Federal government in Nigeria*. University of California Press.[33]

Ayo, C. K., Adewoye, J. O., & Oni, A. A. (2011). "Business-to-consumer e-commerce in Nigeria: Prospects and challenges". *African Journal of Business Management, 5(13): 5109–5117.*[10]

Chopra, S., & Meindl, P. (2016). *Supply Chain Management: Strategy, Planning, and Operation.*[22]

Christian P. (2017). "The Impact of E-commerce on the Supply Chain". Erasmus University Rotterdam, Erasmus School of Economics. [27]

Igwe, Ebenezer N., Alaba, OLumuyiwa B. & Abass, Olalere A. (2021). A Review of e-commerce Adoption in Nigeria Based on Security & Trust- University of Ibadan. *Journal of Science & Logics in ICT Research.*[11]

Heizer, J., & Render, B. (2018). *Operations Management: Sustainability and Supply Chain Management* (12th ed.). Pearson Education Limited. [18]

Jiang, L, Yang, Z, and Jun, M. (2013). Measuring Consumer Perceptions of Online Shopping Convenience. *Journal of Service Management, 24(2), 191-214. http://doi.org/10.1108/09564231311323962.*[8]

Johnson, M. E., & Whang, S. (2002). E- business and supply chain management: an overview and framework. *Production and Operations management*, *11*(4), 413-423.[38]

Kumar, V., & Reinartz, W. (2016). Creating enduring customer value. *Journal of marketing*, *80*(6), 36-68.[35]

Lee, J., Ardakani, H. D., Yang, S., & Bagheri, B. (2015). Industrial big data analytics and cyber-physical systems for future maintenance & service innovation. *Procedia cirp*, *38*, 3-7. [37]

Li Y. and Fan R. (2014). *The coordination of E-commerce and Logistics – A case study of Amazon*. Unpublish B. Tech Thesis.[4]

May, B. I., Atkinson, M.P., and Ferrer, G. (2017). Applying inventory classification to a large inventory management system. *Journal of Operations and Supply Chain Management (JOSCM)*, 10(1), 68-86

Meng M., Lu S. and XuanQing Sun (2022). "Optimization of e-commerce logistics service quality considering multiple consumption Psychologies". doi; 10.3389/fpsyg.2022.956418. PMCID; PMC9484527 / PMID; 36132194. [2]

Monden, Y. (2011). Toyota Production System: an integrated approach to just-in-time. CRc Press. [19]

Myovella, G., Karacuka, M., & Haucap, J. (2020). Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies. *Telecommunications Policy*, *44*(2), 101856. [13]

Ngozi (2021). *Ethics & the Prospect of E-commerce Platforms in Doing Business in Nigeria*. Intec Open. [25]

Omorinde O.A (2023). The Impact of E-commerce on Logistics Activities of Manufacturing Industry in Nigeria. Unpublished Ph.D. Thesis. [32]

Ramanathan, R. (2010). "The moderating roles of risk and efficiency on the relationship between logistics performance and customer loyalty in E-commerce. "Transportation Research Part E: Logistics and Transportation Review (2010), 46(6): 950-962. [5]

Richey, R. C., & Klein, J. D. (2005). Developmental research methods: Creating knowledge from instructional design and development practice. *Journal of Computing in higher Education*, *16*, 23-38.[36]

Rodolfo, M. F., Claudimar, P. V., Cassia, R. V., Thales, S. G., & Wesley, V., S. (2023). "After-Sales Attributes in E-commerce: A Systematic Literature Review and Future Research Agenda" *Journals / JTAER /* Volume 18(1). http://doi.org/10.3390/jtaer18010025. [31]

Rosen, A. (2002). The E-commerce question and answer book; A survival guide for business managers (2nd edition), AMACOM, New York. [1]

Saarah H. and Mwapwele S. D. (2023). "A Systematic Literature Review on the Factors Influencing E-commerce Adoption in Developing Countries". Division of Information Systems, University of Witwatersand, Johannesburg, South Africa. http://doi.org/10.1016/j.dim.2023.100045. [28]

Sculopa, A. (2003). The Adoption of Internet Commerce by SMEs in the South of Italy: An Environmental, Technological and Organizational Perspective. [*J] Journal of Global Information Technology Management, (2003),6(1), 52-71.[16]*

Societe Generale Report (2020). 'Nigerian Market': E-commerce. http://importexport.societegenerale.fr/en/country/nigeria/ecommerce/accepter_cookies= ou. Retrieved on June 2022. [21]

Somuyiwa, A., Onifade, O. A., & Dosunmu, V. (2021). Maritime Logistics and The Role of Ict in the Optimization Of Cargothroughput In Nigeria. *Business Logistics in Modern Management*, *21*, 259-276. [7]

ThomasNet (2010). *Industry Market Barometer study*. Retrieved from: https://www.thomasnet.com/pressroom/IMB_SURVEY_2010. [12]

Waters D. (2011). Supply Chain Risk Management: vulnerability and resilience in logistics. Kogan page publishers. [22]

Will K. (2023). "*Logistics; What it means and How Businesses use it*". Investopedia.com. [3]

Winkelhaus, S., & Grosse, E. H. (2020). Logistics 4.0: a systematic review towards a new logistics system. *International Journal of Production Research*, *58*(1), 18-43.[23]

Yingli Li and Ruoxi Fan (2014). The coordination of E-commerce and Logistics – A case study of Amazon. [25]