

ECONOMIC ORDER QUANTITY AND LOGISTICS PERFORMANCE OF QUOTED OIL AND GAS COMPANIES IN NIGERIA

BERNARD Peniel

Department of Marketing, Faculty of Administration and Management,
Rivers State University Port Harcourt
peniel.bernard@ust.edu.ng

AKEKUE-ALEX Nennaaton

Department of Marketing, Faculty of Administration and Management,
Rivers State University Port Harcourt
peniel.bernard@ust.edu.ng

GLADSON-NWOKAH Juliet Ijeoma

Department of Marketing, Faculty of Administration and Management,
Rivers State University Port Harcourt
peniel.bernard@ust.edu.ng

Abstract

This study investigated the relationship between economic order quantity (EOQ) and logistics performance of quoted oil and gas companies in Nigeria. The oil and gas industry faces significant logistical challenges, including high transportation costs, overstocking, and stock-outs, which adversely affect operational efficiency. Utilizing a cross-sectional research design, data were collected through structured questionnaires administered to senior managers in operations, logistics, and warehousing across nine oil and gas companies. Spearman's Rank Order Correlation was employed for data analysis, revealing strong, positive correlations between EOQ and key logistics performance indicators: on-time delivery, order Fulfilment, and transportation costs ($p < .005$). The findings demonstrate that implementing EOQ can significantly enhance inventory management, reduce costs, and improve logistics outcomes in the sector. The study contributes to the existing literature by highlighting the underexplored application of EOQ in Nigeria's oil and gas industry and underscores the need for effective inventory management practices to optimize logistics performance. Recommendations are provided for industry practitioners to integrate EOQ principles into their inventory management strategies to achieve operational excellence.

Keywords: Economic order quantity, on-time delivery, order fulfilment, logistics performance transportation costs

Introduction

Effective inventory management is essential to optimizing logistics performance, particularly in industries characterized by complex supply chains, such as oil and gas. The oil and gas sector is marked by capital-intensive operations, high transportation costs and volatile demand, which collectively pose significant logistical challenges (Li et al., 2021). Efficient inventory management is crucial to addressing these challenges, primarily by minimizing costs associated with overstocking, stock-outs, and transportation inefficiencies. Despite its importance, many oil and gas companies in Nigeria continue to struggle with inventory management issues, leading to negative impacts on their logistics performance.

One of the most recognized tools for optimizing inventory management is economic order quantity (EOQ) model. EOQ is widely regarded as an effective framework for determining the optimal order quantity that minimizes total costs of ordering and holding inventory (Benton, 2010; Schneller & Smeltzer, 2006; Gupta & Gupta, 2009). Numerous studies across various sectors, including manufacturing, retail, healthcare, automotive and pharmaceuticals, have

shown that implementation of EOQ model leads to reduced inventory holding costs, prevent of stock-outs, and improved order fulfilment and on-time delivery (Ramanathan, 2006; Buxey, 2006; Kumar & Shrivastava, 2013).

However, despite these positive outcomes in other industries, the specific application of EOQ in the Nigerian oil and gas sector remains underexplored. In this context, inadequate inventory management often results in delayed deliveries, inefficient order fulfilment, and increased transportation costs, further exacerbating logistics performance issues. Given the high operational costs and the critical need for timely delivery of products in the oil and gas sector, it is imperative to adopt more effective inventory management practices such as EOQ, to enhance logistics performance.

The scarcity of empirical research on the relationship between EOQ and logistics performance in Nigerian oil and gas companies highlights a significant gap in the existing literature. This gap raises concerns about whether companies in this sector are effectively leveraging EOQ to improve their logistics outcomes. To address this gap, the present study aims to investigate the relationship between EOQ and logistics performance of quoted oil and gas companies in Nigeria. Specifically, the research focused on key logistics performance indicators, such as on-time delivery, order fulfilment, and transportation costs, to assess the extent to which EOQ can enhance logistics efficiency in this critical sector.

By exploring this relationship, the study has provided valuable insights that can guide strategic decisions in inventory management, ultimately contributing to improved logistical outcomes and operational efficiency in Nigeria's oil and gas sector. Based on the above objectives, the study posed the following research questions:

1. What is the relationship between EOQ and on-time delivery of quoted oil and gas companies in Nigeria?
2. What is the relationship between EOQ and order fulfilment of quoted oil and gas companies in Nigeria?
3. What is the relationship between EOQ and transportation cost of quoted oil and gas companies in Nigeria?

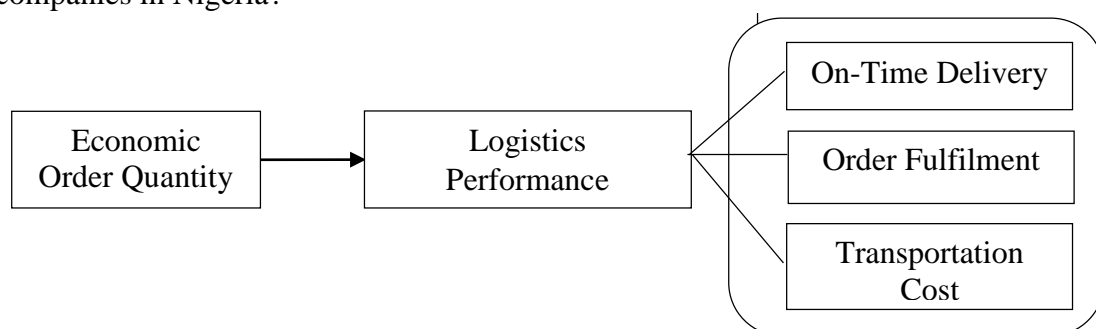


Fig. 1: Conceptual Framework of Economic order quantity and Logistics performance.

Theoretical Foundation

The Theory of Constraints (TOC) (Goldratt, 1984) is the theory upon which this study was grounded. TOC identified and addressed bottlenecks that limit an organization's performance. It posits that significant improvements can be achieved by systematically identifying and managing critical constraints within a system. In inventory management, TOC emphasizes the

importance of optimizing inventory levels and flows to eliminate bottlenecks and ensure smooth operations.

One of the primary benefits of applying TOC in the oil and gas industry is the enhancement of operational efficiency. By identifying and managing constraints, firms can streamline their processes, reduce downtime and boost productivity. This is particularly important in the Nigerian context, where operational inefficiencies can result in significant financial losses (Obasi & Nwankwo, 2021). TOC also enhance decision-making by providing a structured approach to identifying critical constraints affecting a firm's performance (Harris, 1913). This focused approach enable managers to make more informed decisions regarding resource allocation and improvement efforts. In the oil and gas sector, where decision-making is often complex and involves substantial risk, TOC can lead to more favorable outcomes (Akinwale & Ojo, 2023).

Companies that implement TOC in conjunction with EOQ, can significantly optimize their logistics performance by reducing instances of stock-outs and excess inventory, which leads to enhanced logistics performance (Cohen & Lee, 2013). Furthermore, by improving logistics performance through TOC, companies can achieve faster delivery times, reduce lead times, and enhance customer satisfaction, ultimately fostering greater competitiveness in the market.

Research supports the notion that companies employing TOC principles alongside EOQ strategies experience improved operational efficiencies. Gupta and Jain (2017) found that organizations focusing on their constraints while optimizing order quantities achieved higher performance levels compared to those that did not. This finding is particularly pertinent for the Nigerian oil and gas sector, where logistics efficiency is critical to maintaining operations in a competitive environment. TOC provides valuable insights for managing EOQ and enhancing logistics performance of quoted oil and gas companies. By systematically identifying and addressing constraints within their logistics processes, these companies can optimize their inventory management practices, enjoy improved operational efficiency and customer satisfaction.

Concept of Economic Order Quantity

EOQ model (Harris, 1913) is a mathematical formula that determine the optimal order quantity to minimize total inventory costs, encompassing ordering, holding and stock-out costs. Its relevance spans various industries, including oil and gas, due to its simplicity and effectiveness in balancing these costs to enhance overall operational efficiency. EOQ is widely utilized across retail, manufacturing, and logistics to optimize inventory levels. By calculating the ideal order quantity, businesses can reduce unnecessary holding costs and order frequency. This efficiency is particularly crucial in industries where inventory costs significantly affect profit margins. Xu and Jin (2021) demonstrated that companies employing EOQ models achieved a 20% reduction in total inventory costs.

The application of EOQ may be enhanced by integrating advanced technologies. For example, the use of RFID technology alongside EOQ allows for accurate and real-time inventory data, enabling better decision-making and cost optimization (Li & Visich, 2021). This integration helps organizations maintain optimal inventory levels and respond swiftly to market fluctuations. Companies effectively utilize EOQ principles by incorporating safety stock and adjusting for demand variability, ensuring more resilient inventory management strategies (Duzak, 2020).

By minimizing total inventory costs, including ordering and holding expenses, companies can enhance their profit margins (Wang & Wang, 2019). EOQ facilitates the maintenance of optimal inventory levels, reducing the risk of stock-outs and excess inventory, which can lead to obsolescence and waste. Efficient inventory management supported by EOQ leads to smoother operational processes, enabling firms to plan their production and logistics activities more effectively (Goh et al., 2020).

EOQ remains a fundamental concept in inventory management, providing organizations with a robust framework to minimize costs and optimize inventory levels. While its assumptions may not always align with real-world complexities, the underlying principles of EOQ continue to offer valuable insights for effective inventory management strategies, especially in cost-sensitive industries like oil and gas.

Concept of Logistics Performance

Drucker (1963) emphasized the importance of minimizing costs while ensuring timely delivery, establishing logistics as a crucial driver of operational efficiency. Bowersox (1978) expanded on this concept by highlighting the necessity of integrating and coordinating logistics activities to meet both service and cost objectives, ultimately enhancing overall business performance. This integration underscores the foundational role of logistics in balancing cost efficiency with service quality. Lambert and Stock (1993) recognized the need for balanced performance metrics that consider both service quality and efficiency. Achieving high levels of logistics performance requires a comprehensive understanding of the trade-offs between these two critical factors.

Mentzer and Konrad (1991) provided a comprehensive definition of logistics performance that integrates both qualitative and quantitative measures, thereby capturing the full spectrum of logistics effectiveness. This dual approach highlights the importance of both customer satisfaction and cost efficiency in driving logistics success (Mentzer & Konrad, 1991). Christopher (1992) articulated the strategic importance of logistics performance in achieving competitive advantage, asserting that organizations can differentiate themselves in the market by delivering the right product, in the right quantity, at the right time, and at the right cost. This perspective underscores the role of logistics in enhancing business competitiveness and market responsiveness.

Logistics performance is a vital component of supply chain management, playing a crucial role in meeting customer demands and enhancing service quality. Organizations that excel in logistics performance are better positioned to respond to market changes, reduce lead time, and improve customer satisfaction. Lambert et al. (1998) states that high logistics performance leads to improved customer service levels, which can enhance a company's market share and profitability.

In the context of quoted oil and gas companies in Nigeria, effective logistics performance is critical to managing complex supply chain operations and ensuring the efficient and effective movement of goods and services. These companies operate in a highly dynamic and competitive environment where logistics performance directly impacts operational efficiency, cost management and customer satisfaction (Christopher, 1992).

Logistics performance has several dimensions, including improved customer service, efficient movement of goods, on-time delivery, reduce lead time and responsiveness to market demand. In this study however, we adopt on-time delivery order fulfilment and transportation cost as dimensions of logistics performance.

On-time delivery

On-time delivery (OTD) is a crucial aspect of logistics management that ensures the timely fulfilment of customers' orders and optimize overall supply chain efficiency. Traditionally, OTD has been defined as the ability to deliver goods within agreed-upon schedules (Ballou, 1987). OTD can be characterized as the percentage of orders delivered within specified time frames, emphasizing the importance of timeliness in meeting customer expectations (Cooper et al., 1997; Bowersox & Closs, 1996).

Cooper et al. (1997) describe OTD as timely completion of tasks within the supply chain, further reinforcing the concept of OTD as a critical performance metric. Christopher (1992) adds to this discussion by emphasizing the need for adherence to planned lead times, which should not exceed established delivery windows. In the contemporary context, Fugate et al. (2010) define OTD as a performance indicator that orders are delivered on or before scheduled. Chopra and Meindl (2016) elaborate on this by stating that OTD also considers lead times and service level agreements, underlining the multifaceted nature of this metric.

Furthermore, Harrison and van Hoek (2008) highlight the importance of adhering to delivery schedules as essential to meeting customer expectations. Benton and Maloni (2005) stress the need to achieve delivery objectives without exceeding planned lead times, indicating that both efficiency and reliability are vital components of successful logistics performance.

Overall, OTD is integral to customer satisfaction and operational efficiency (Fugate et al., 2010). In the context of oil and gas companies in Nigeria, achieving OTD presents additional challenges due to infrastructure limitations, regulatory constraints and geopolitical risks (Benton & Maloni, 2005). Traditional measures of OTD focus on delivery performance metrics, including order cycle time and delivery lead time (Ballou, 1987). Bowersox and Closs (1996) suggest incorporating metrics such as order fill rate and perfect order performance as indicators of OTD.

Order fulfilment

Order fulfilment is a critical component of supply chain management, involving the process of generating, filling, delivering, and servicing customers' orders. Laurikaben (2020) define order fulfilment as the comprehensive process of handling customer orders from inception to delivery, emphasizing its role in customer satisfaction. This definition echoes the work of Sarite et al. (2018) who describe order fulfilment as the generation, delivery and servicing of customer orders. Both perspectives highlight the multifaceted nature of order fulfilment, stressing that it goes beyond mere product delivery, but include the entire lifecycle of a customer's order.

To achieve efficient order fulfilment, Sarite et al. (2018) assert that organizations must design a network and processes that meet customer demands while maximizing profitability. At the operational level, order fulfilment processes focus heavily on logistics, ensuring that the right products are delivered to the right customers on time. Foster (2015) adds that effective order fulfilment management offer several benefits, including increased efficiency, which is crucial to overall success of a firm.

One critical aspect of order fulfilment is order cycle time. Meller (2015) introduces this concept, explaining it as the total time from when a customer places an order to when the order is delivered. Order cycle time is essential to order fulfilment because customers value shorter waiting time. Further elaborating on order fulfilment, Fawcett and Fawcett (2014) propose that it should include essential elements such as product availability, timely deliveries, flexibility, transparent and reliable service, and effective service recovery in cases of service failure.

Transportation cost

Transportation costs are variable costs, including cost of fuel, labor, maintenance, loading, unloading, pick-up, and delivery expenses (Hu, 2022). These factors not only influence operational efficiency but also affect total cost structure of logistics. Thai et al. (2021) add that transportation costs have far-reaching implications on economic activities and international trade.

Transportation is a central component of logistics that connects various stages of value creation and delivery (Kamungo, 2014). Transportation is crucial from manufacturing to final delivery and returns. Effective coordination between transportation components is necessary to maximize logistical benefits.

The cost of delivering products is integral to the overall production cost. This idea aligns with the idea that transportation is a primary cost component in logistics, and that any reduction in transportation cost significantly reduce total logistics costs (Parkhi et al., 2014). Transportation cost reduction has been a focus of research, with studies ranging from routing optimization (Eilon et al., 1971) to cost minimization (Bodin et al., 1993).

Focusing on distribution, Wu (2014) argues that distribution costs represent a substantial proportion of total transportation expenses; and that path planning is a core issue of distribution systems that reduce service costs. Yang et al. (2014) supports this view by asserting that well-planned routes for logistics distribution cut transport costs.

In the view of Yang et al. (2014), distribution efficiency is crucial to enhanced effectiveness of logistics system and efficient transportation. Hu (2022) contends that transportation cost management involves accounting for multiple factors, including modes of transportation, each of which influence overall cost and quality of logistics service.

Economic Order Quantity and Logistics Performance

Empirical studies across multiple industries have demonstrated that EOQ positively impacts logistics performance. By optimizing order quantities, EOQ helps companies reduce inventory holding costs, avoid stock-outs, and improve overall efficiency of logistics operations.

Benton (2010) conducted an empirical study in the U.S. manufacturing sector and found that EOQ improved logistics performance by reducing inventory holding costs by 15% and ensuring timely availability of raw materials. This report supports extant literature which assert that EOQ optimizes inventory levels, lead to smoother operations and reduced delivery delays.

Ramanathan (2006) performed an empirical analysis of retail chains in the UK and found that EOQ reduced holding costs by 20% and improved logistics performance by minimizing stock-outs and optimizing order cycles. This empirical evidence reinforces reports in literature that EOQ help retailers manage stock levels effectively and improve logistics outcomes.

Schneller and Smeltzer (2006) examined the application of EOQ in hospitals in the U.S. and found that it improved logistics performance by 18%, reducing stock-outs and optimizing resource allocation. This evidence aligns the view that EOQ enhances logistics performance in the healthcare industry by ensuring availability of critical medical supplies.

In other studies, Buxey (2006) found that EOQ improved logistics performance by reducing holding costs by 25% and improving lead times for high-demand components; Gupta and Gupta (2009) reported that EOQ improved logistics performance by reducing stock-outs by

30% and optimizing order quantities for essential drugs; Kumar and Shrivastava (2013) found that EOQ improve logistics performance by reducing waste by 22% and ensure timely replenishment of perishable items; while Chen and Liu (2014) found that EOQ improved logistics performance by reducing lead times by 18% and optimizing stock levels for high-demand components.

Both conceptual and empirical review reviews attests that EOQ has substantial positive impact on logistics performance across various industries. EOQ contributes to better stock management, reduced stock-outs, and improved logistics efficiency. These benefits are consistently observed in manufacturing, retail, healthcare, automotive, pharmaceutical, food and beverage, and electronics industries. These evidence further strengthens the view that EOQ is an essential tool for improving logistics performance. Nevertheless, in lieu of our need to conduct statistical analyses and interpretations, we hypothesize as follows:

H01: There is no significant relationship between EOQ and on-time delivery of quoted oil and gas companies in Nigeria.

H02: There is no significant relationship between EOQ and order fulfilment of quoted oil and gas companies in Nigeria.

H03: There is no significant relationship between EOQ and transportation cost of quoted oil and gas companies in Nigeria.

Methodology

The study adopted a survey research design. The population for the study comprised 9 oil and gas companies listed on the Nigerian Exchange Group's official website (NGX, 2024). The study adopted the entire population as its operational unit of analysis. 3 copies of the research instrument were sent to each of the 9 quoted oil and gas companies involving senior managers of the operations, logistics and warehousing, resulting in a total of 27 respondents. Structured questionnaire was administered to senior managers in charge of warehousing, operations, and logistics. The final analyses of the study was based on useable data obtained from 20 respondents. The validity of the instrument was ascertained through content and construct validity tests. To assess the reliability of instrument, internal reliability tests was conducted using Cronbach's Alpha. The Spearman's Rank Order Correlation was used examine the relationships between EOQ and measures of logistics performance. The SPSS statistical software facilitated data analysis.

Data Analysis and Results

Table 1: Correlation between Economic Order Quantity and On-Time Delivery

		Economic Order Quantity	On-Time Delivery
Spearman's rho	Economic Order Correlation Coefficient	1.000	.996**
	Quantity		
	Sig. (2-tailed)	.	.000
	N	20	20
	On-Time Correlation Coefficient	.996**	1.000
	Delivery		
	Sig. (2-tailed)	.000	.
	N	20	20

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

Source: Desk Research (2024)

Table 1 illustrates the Spearman Rank Order Correlation result generated by the statistical package for social science (SPSS) version 25. The attendant p-value of the relationship between EOQ and on-time delivery is revealed to be significant (where $p = .000$) which is less than 0.05

as stated in our decision rule. The result from the Spearman rho correlation is .996. This result shows that EOQ has a very strong relationship with on-time delivery. Also, we observe the sign to be positive indicating a very strong and positive relationship exist between EOQ and on-time delivery. Based on this result we therefore reject the null hypothesis.

Table 2: Correlation between Economic Order Quantity and Order Fulfilment

			Economic Order Quantity	Order Fulfilment
Spearman's rho	Economic Quantity	Correlation Coefficient	1.000	.979**
		Sig. (2-tailed)	.	.000
		N	20	20
	Order Fulfilment	Correlation Coefficient	.979**	1.000
		Sig. (2-tailed)	.000	.
		N	20	20

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

Source: Desk Research (2024)

Table 2 illustrates the Spearman Rank Order Correlation result generated by the statistical package for social science (SPSS) version 25. The attendant p-value of the relationship between EOQ and order fulfilment is revealed to be significant (where $p = .000$) which is less than 0.05 as stated in our decision rule. The result from the Spearman rho correlation is .979 from this result we see that EOQ has a very strong relationship with order fulfilment. Also, we observe the sign to be positive indicating a very strong and positive relationship exist between EOQ and order fulfilment. Based on this result we therefore reject the null hypothesis.

Table 3 Correlation Analysis depicting the relationship between Economic Order Quantity and Transportation Cost

			Economic Order Quantity	Transportation Cost
Spearman's rho	Economic Quantity	Correlation Coefficient	1.000	.946**
		Sig. (2-tailed)	.	.000
		N	20	20
	Transportation Cost	Correlation Coefficient	.946**	1.000
		Sig. (2-tailed)	.000	.
		N	20	20

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

Source: Desk Research (2024)

Table 3 illustrates the Spearman Rank Order Correlation result generated by the statistical package for social science (SPSS) version 25. The attendant p-value of the relationship between EOQ and transportation cost is revealed to be significant (where $p = .000$) which is less than 0.05 as stated in our decision rule. The result from the Spearman rho correlation is .946 from this result we see that EOQ has a very strong relationship with transportation cost. Also, we observe the sign to be positive indicating a very strong and positive relationship exist between EOQ and transportation cost. Based on this result we therefore reject the null hypothesis.

Discussion of Findings

The EOQ model is a fundamental inventory management tool used to determine the optimal quantity of inventory that minimize costs associated with purchasing, receiving and storing. This study examined the connection between EOQ and logistics performance, and the results

of the empirical tests performed, showed that EOQ has positive and statistically significant connection with logistics performance.

This finding aligns with previous studies such as Li et al. (2021), who reported that EOQ is essential to determining optimal order quantity for minimizing total inventory costs. This finding is also consistent with the report that EOQ optimizes order quantities, reducing order frequency and lowering overall costs, ultimately leading to better fulfilment performance (Xu & Jin, 2021).

In addition, the finding support the position that EOQ improves inventory control and reduces total inventory costs (Quin et al., 2022). EOQ model has proven to be a critical tool in minimizing various costs, including ordering, carrying materials, and transportation, while improving key logistics metrics such as on-time delivery and order fulfilment.

Conclusion and Recommendations

This study investigated the relationship between EOQ and logistics performance of quoted oil and gas companies in Nigeria. The findings revealed a significant and positive correlation between EOQ and indicators of logistics performance (on-time delivery, order fulfilment, and transportation costs). Specifically, the results demonstrated that EOQ lead to improved logistics efficiency by minimizing unnecessary costs associated with overstocking and stock-outs, thereby enhancing overall logistics performance.

In view of the results of the study, we concluded that EOQ has significant relationship with logistics performance; and recommend that quoted oil and gas companies in Nigeria should adopt the EOQ model in their inventory management practices. By utilizing EOQ, these companies can optimize their order quantities to minimize inventory holding costs, reduce stock-outs, and enhance overall logistics performance.

References

- Akinwale, A. A., & Ojo, J. A. (2023). The Role of decision-making in oil and gas logistics performance: Insights from the Theory of Constraints. *International Journal of Energy Economics and Policy*, 13(2), 35-44.
- Ballou, R. H. (1986). *Managing supply chain logistics*. Wiley.
- Ballou, R. H. (1987). The measurement of logistics performance. In G. E. Gordon & J. B. O'Reilly (Eds.). *Logistics: Principles and practices* (pp. 47-56). McGraw-Hill.
- Benton, W. C. (2010). *Purchasing and Supply Chain Management*. McGraw-Hill.
- Benton, W. C., & Maloni, M. J. (2005). Corporate social responsibility in supply chain management: A review of the literature and a proposed framework. *Journal of Business Logistics*, 26(1), 1-27.
- Bodin, L., Golden, B., Assad, A., & Ball, M. (1993). Routing and scheduling of vehicles and crews: The state of the art. *Computers & Operations Research*, 10(2), 63-211.
- Bowersox, D. J. (1978). *Logistics management: The integrated supply chain approach*. McGraw-Hill.
- Bowersox, D. J., & Closs, D. J. (1996). *Logistical management: The integrated supply chain process (2nd edition)*. McGraw-Hill.

- Buxey, G. (2006). The role of EOQ in automotive logistics: A case study. *International Journal of Production Economics*, 104(1), 193-201.
- Chen, L., & Liu, X. (2014). EOQ and its impact on logistics efficiency in electronics manufacturing. *Journal of Logistics and Supply Chain Management*, 8(2), 132-146.
- Chopra, S., & Meindl, P. (2016). *Supply chain management: Strategy, planning, and operation (6th edition)*. Pearson.
- Christopher, M. (1992). *Logistics and supply chain management*. Pitman Publishing.
- Cohen, M. A., & Lee, H. L. (2013). Strategic supply chain management. *Sloan Management Review*, 54(2), 77-89.
- Cooper, M. C., Lambert, D. M., & Pagh, J. D. (1997). *Supply chain management: More than a new name for logistics*. *The International Journal of Logistics Management*, 8(1), 1-14.
- Coyle, J. J., Langley, C. J., Gibson, B. J., Novack, R. A., & Bardi, E. J. (2016). *Supply Chain Management: A Logistics Perspective (9th edition)*. Cengage Learning.
- Drucker, P. F. (1963). *Managing for results*. Harper & Row.
- Duzak, D. (2020). Integrating safety stock into EOQ models: A new perspective. *Journal of Supply Chain Management*, 56(2), 45-58.
- Eilon, S., Watson-Gandy, C. D. T., & Christofides, N. (1971). *Distribution management: Mathematical modelling and practical analysis*. Griffin.
- Fawcett, S. E., & Fawcett, A. M. (2014). *The definitive guide to order fulfillment and customer service: Principles and strategies for planning, organizing, and managing fulfillment and service operations*. Pearson Education.
- Foster, T. A. (2015). Order fulfillment strategies for high efficiency. *Supply Chain Quarterly*.
- Fugate, B. S., Mentzer, J. T., & Stank, T. P. (2010). Linking improved customer service to logistics performance: A historical perspective. *Journal of Business Logistics*, 31(2), 61-82. <https://doi.org/10.1002/j.2158-1592.2010.tb00026.x>
- Goh, M., Lim, J. Y. S., & Lee, T. (2020). Inventory management practices and supply chain performance: A study of the oil and gas industry. *International Journal of Production Economics*, 221, 107496. <https://doi.org/10.1016/j.ijpe.2019.07.010>
- Goldratt, E. M. (1984). *The goal: A process of ongoing improvement*. North River Press.
- Goldratt, E. M. (1990). *Theory of constraints: A systems approach to continuous improvement*. North River Press.
- Guan, J., & Liu, J. (2019). Assessing the impact of logistics performance on customer satisfaction in the retail sector: Evidence from China. *Journal of Retailing and Consumer Services*, 48, 276-286. <https://doi.org/10.1016/j.jretconser.2019.02.012>
- Gunasekaran, A., & Kobu, B. (2007). Performance measures and metrics in a supply chain environment. *International Journal of Production Economics*, 107(1), 330-342.
- Gupta, A., & Gupta, M. (2009). EOQ model and logistics performance in the pharmaceutical industry. *International Journal of Operations and Production Management*, 29(3), 250-263.
- Gupta, A., & Jain, P. (2017). Supply chain management: Theory and practice. *International Journal of Supply Chain Management*, 6(1), 1-10.
- Harris, F. W. (1913). How Many Parts to Make at Once. *Factory: The Magazine of Management*, 10(2), 135-136.
- Harrison, A., & van Hoek, R. (2008). *Logistics management and strategy: Competing through the supply chain (2nd edition)*. Pearson Education Limited.
- Hu, Y. (2022). Cost management in logistics transportation: Factors and strategies. *Journal of Logistics Research*, 45(3), 121-138.

- Ivanov, D., & Dolgui, A. (2020). A digital supply chain twin for managing the ripple effect in the supply chain. *International Journal of Production Research*, 58(10), 3060-3074. <https://doi.org/10.1080/00207543.2020.1764680>
- Kamungo, E. (2014). The role of transportation in logistics and supply chain management. *Supply Chain Review*, 6(2), 34-47.
- Khan, S. A., Jha, A., & Awan, U. (2021). The Role of technology in improving logistics performance: Evidence from the logistics industry. *Sustainable Cities and Society*, 68, 102801. <https://doi.org/10.1016/j.scs.2021.102801>
- Kumar, A., & Kumara, N. (2005). An Evaluation of Logistics Performance of Indian Firms: An Empirical Study. *Supply Chain Management: An International Journal*, 10(2), 133-141. <https://doi.org/10.1108/13598540510589850>
- Kumar, A., & Shrivastava, P. (2013). EOQ model in the food and beverage industry: A study on waste reduction and logistics performance. *Journal of Food Industry Logistics*, 5(1), 100-110.
- Kumar, V., & Kumara, S. (2005). The role of technology in logistics performance management. *International Journal of Logistics: Research and Applications*, 8(3), 183-193.
- Lambert, D. M., & Stock, J. R. (1993). *Strategic logistics management*. Irwin.
- Lambert, D. M., Emmelhainz, M. A., & Gardner, J. T. (1998). Building successful logistics partnerships. *Journal of Business Logistics*, 19(2), 129-147.
- Laurikaben, K. (2020). *Order fulfillment: Processes and customer satisfaction*. Logistics Today.
- Li, L., & Visich, J. K. (2021). The role of RFID technology in supply chain management: A review. *International Journal of Production Economics*, 221, 107524. <https://doi.org/10.1016/j.ijpe.2019.107524>
- Li, X., Zhang, Y., & Li, H. (2021). Economic order quantity model for minimizing total inventory cost: Applications in supply chain management. *Journal of Operations and Supply Chain Management*, 14(1), 57-69.
- Li, Y., Yang, J., & Zhang, J. (2017). The role of supplier relationship management in the relationship between supplier integration and operational performance: Evidence from the oil and gas industry. *International Journal of Production Economics*, 185, 263-272. <https://doi.org/10.1016/j.ijpe.2017.01.014>
- Mangan, J., Lalwani, C., Lalwani, C. S., & P. W. (2016). *Global logistics and supply chain management (3rd edition)*. Wiley.
- Matsuo, H. (2019). The role of technology in inventory management and logistics performance. *International Journal of Logistics Management*, 30(2), 472-487.
- Meller, R. D. (2015). Order fulfillment cycle time: Reducing customer waiting times. *Journal of Operations Management*, 22(4), 482-498.
- Mentzer, J. T., & Konrad, B. (1991). An assessment of the logistics performance of U.S. firms. *Journal of Business Logistics*, 12(2), 31-51.
- Mentzer, J. T., Min, S., & Bobbitt, L. M. (2001). Toward a Unified Theory of Supply Chain Management. *Journal of Business Logistics*, 22(2), 18-32.
- Mishra, D., Mishra, S., & Khatri, P. (2020). Role of human resource development in enhancing logistics performance: Evidence from Indian manufacturing firms. *Benchmarking: An International Journal*, 27(4), 1457-1473. <https://doi.org/10.1108/BIJ-06-2018-0198>
- Obasi, I. A., & Nwankwo, B. O. (2021). Operational efficiency in the Nigerian oil and gas sector: An analysis of bottlenecks and constraints. *Journal of Business and Management*, 23(4), 56-65.

- Parkhi, S., Jagadeesh, S., & Kumar, R. (2014). *Transportation cost optimization in logistics*. International Journal of Logistics Systems and Management, 10(1), 23-37.
- Quin, R., Song, S., & Liu, J. (2022). The impact of EOQ on inventory management in the oil and gas sector: A case study of Nigerian firms. *International Journal of Supply Chain Management*, 13(1), 72-84.
- Ramanathan, U. (2006). EOQ in UK retail chains: An empirical study. *Journal of Retail Logistics*, 11(3), 205-216.
- Sarite, J., Iravo, M., & Ismail, R. (2018). Order fulfillment and its role in customer satisfaction. *International Journal of Supply Chain Management*, 7(3), 29-37.
- Schneller, E., & Smeltzer, L. (2006). *Strategic management of the health care supply chain*. Jossey-Bass.
- Sweeney, J. C., & Soutar, G. N. (2001). Consumer Perceived Value: The Development of a Multiple Item Scale. *Journal of Retailing*, 77(2), 203-220.
- Thai, M. T., Lai, K. H., & Yuen, K. F. (2021). The impact of transport costs on economic activity and trade. *Transport Policy*, 98, 111-121.
- Tse, Y. K., Tan, K. H., & Lim, M. K. (2018). The role of capabilities in the relationship between resources and logistics performance: Evidence from the oil and gas industry. *Supply Chain Management: An International Journal*, 23(3), 234-247.
- Wang, Y., & Wang, Y. (2019). Economic order quantity model with price discount and trade credit. *Mathematical Problems in Engineering*. 9794128. <https://doi.org/10.1155/2019/9794128>
- Wu, F. (2014). Distribution systems and transport costs: Key factors and planning. *Journal of Distribution Management*, 29(2), 67-82.
- Xu, G., & Jin, H. (2021). EOQ's role in optimizing order fulfillment processes. *International Journal of Logistics and Operations Research*, 20(3), 150-168.
- Yang, X., Liu, H., & Chen, L. (2014). Logistics distribution and transport efficiency. *Transportation Research*, 18(4), 441-456.