

## ELECTRONIC DATA INTERCHANGE (EDI) AND SUPPLY CHAIN VISIBILITY AMONG ROAD TRANSPORT FIRMS IN NIGERIA

**Godspower Saro DIKE**

Centre for Logistics and Transport, University of Port Harcourt, Nigeria

[godspower\\_dike@uniport.edu.ng](mailto:godspower_dike@uniport.edu.ng)

**Endurance Ikechi EKE**

Faculty of Maritime Studies, Admiralty University of Nigeria, IBUSA, Delta State, Nigeria

[eke.endurance@adun.edu.ng](mailto:eke.endurance@adun.edu.ng)

**ABSTRACT:** Electronic Data Interchange (EDI), especially in transport-intensive industries, has emerged as a key facilitator of supply chain visibility (SCV) due to the rapidly evolving digital transformation of logistics. Nigerian road transport companies are still hindered by manual procedures, fragmented data, and a limited adoption of digital solutions, despite evidence from around the world that EDI may improve transparency, efficiency, and customer responsiveness. The impact of EDI adoption on supply chain visibility and performance results among road transport companies in Nigeria's Rivers State is examined in this study. Using a cross-sectional quantitative research approach, the Technology–Organization–Environment (TOE) framework served as the guide. Using standardized questionnaires, information was gathered from 282 respondents, including operational staff, managerial staff, and regulatory representatives. While regression and correlation studies looked at the links between variables, descriptive statistics provided an overview of adoption and performance levels. The results show that EDI adoption is moderate ( $M = 3.52$ ), but visibility is relatively low ( $M = 2.09$ ), and performance outcomes, such as efficiency, lead-time improvement, and competitiveness, are weak. Regression results show that EDI is the best predictor of visibility ( $\beta = 0.241$ ,  $p < 0.001$ ), with Transport Management Systems and GPS coming in second and third. Correlation analysis shows that visibility mediates the relationship between EDI adoption and performance. The study comes to the conclusion that in order to achieve a viable SCV in Nigeria, it is necessary to integrate EDI with complementary digital tools, develop skills, and have supportive legislative frameworks in place.

**Keywords:** Electronic Data Interchange (EDI), Supply Chain Visibility, Road Transport Firms, Digitalization, Nigeria, Logistics Competitiveness.

Dike, G. S., & Eke, E. I. (2025). Electronic data interchange (EDI) and supply chain visibility among road transport firms in Nigeria. *International Journal of Leadership, Quality Education and African Development*, 2(4), 519-526.

Copyright © 2025 IJLQEAD

## INTRODUCTION

Electronic Data Interchange (EDI) has emerged as a key technology for attaining end-to-end supply chain visibility (SCV), particularly in transport-intensive scenarios, as a result of the rapidly growing digital transformation of logistics. Digitalization facilitates data-driven decision-making, process integration, and real-time information sharing across global supply chains, which enhances customer service, responsiveness, and efficiency (Attaran, 2020; Gupta et al., 2021; Sun et al., 2022). Structured computer-to-computer exchange of standardized business documents, or EDI, is part of this larger wave. It lowers transaction latency and mistakes,

synchronizes partner information flows, and provides the data backbone needed for SCV (Di Vaio & Varriale, 2020).

Visibility into orders, vehicles, and deliveries is vital for road transport companies, which transport the majority of Nigeria's domestic freight, but they are frequently limited by manual paperwork, fragmented data, and cash-heavy procedures (Moldabekova et al., 2021, Dike & Otto, 2024). By streamlining scheduling and routing, facilitating real-time asset tracking, and reducing financial cycles, complementary digital tools like digital payments, GPS/telematics, and Transport Management Systems (TMS) can increase the impact of EDI (Alesiuniene et al., 2021; Ju et al., 2021; Haddud & Khare, 2020). These technologies work together to provide an integrated digital logistics stack that increases service uptime, reduces operating costs, and fortifies SCV (Vial, 2019).

Adoption of EDI is consistently associated with better visibility outcomes in empirical investigations. Transparency across supply chain nodes is increased by EDI's improved inter-organizational data integration, decreased transaction mistakes, and support for cooperative planning and replenishment (Ngai et al., 2008). Increased order status transparency facilitates proactive exception management, quicker reaction to interruptions, and increased customer satisfaction, which in turn mediates performance advantages (Kim & Narasimhan, 2002). By offering fast, precise demand and shipment data, EDI reduces the bullwhip impact and improves resilience, according to longitudinal studies (Zhang & Dhaliwal, 2009).

Any transport operators, especially in emerging nations, encounter adoption constraints such as upfront costs, skills gaps, interoperability issues, and cybersecurity concerns, even when frontier enterprises use automation and AI at scale (Hornyak, 2018; Kern, 2021). Evidence from Africa shows that infrastructure alone is not enough for technology to yield its full benefits; digital skills and organizational preparedness are also necessary (Ntule et al., 2024). Although digitization has increased e-commerce logistics reliability and decreased costs in Nigeria, worker upskilling is still necessary to maintain gains (Adeniran et al., 2024).

Limited real-time visibility of vehicles and consignments, slow paperwork flows, delayed proof-of-delivery, and low order processing transparency are all consequences of the Nigerian road transport subsector's under-adoption of EDI and related systems. In a market where service quality is increasingly determined by digital readiness, these frictions increase lead times and costs and reduce competitiveness (Moldabekova et al., 2021). However, global data indicates that, in favorable regulatory contexts, supply chain digitization and logistics effectiveness greatly increase firm competitiveness (Wang et al., 2025; Constantin et al., 2025). An actionable gap is shown by this comparison: knowing how EDI adoption directly affects SCV and operational results for road transport companies in Nigeria.

This study investigated the role of EDI in enhancing SCV among road transport firms in Nigeria, guided by the Technology–Organization–Environment (TOE) framework, which explains adoption as a function of technological attributes, organizational readiness, and environmental pressures (Tornatzky & Fleischer, 1990), as well as staged adoption logic (pre-adoption, adoption, post-adoption) in logistics digitalization (Kim & Crowston, 2011). It focuses on how EDI impacts operational efficiency, delivery lead time, transparency, cost reduction, and customer satisfaction both alone and in combination with TMS, GPS/telematics, digital payments, CRM, and analytics (Alesiuniene et al., 2021; Ju et al., 2021; Di Vaio & Varriale, 2020; Hallikas et al., 2021; Fatorachian & Kazemi, 2021; Ning & Yao, 2023). The study intends to produce context-specific insights that guide managerial investment decisions and policy tools that enable interoperable, skills-anchored digital logistics ecosystems by placing Nigerian firm-

level realities within global and regional evidence (Ngai et al., 2008; Chong & Bai, 2014; Zhang & Dhaliwal, 2009; Ntule et al., 2024; Adeniran et al., 2024).

## METHODOLOGY

In order to find out how the use of Electronic Data Interchange (EDI) affects supply chain visibility among Nigerian road transport companies, this study uses a cross-sectional quantitative research approach. Because it enables the systematic gathering of numerical data at a specific moment in time, the design was deemed ideal for statistical study of the links between supply chain effectiveness and EDI adoption. Stakeholders in Nigeria's road transport industry, especially those who run businesses in Rivers State, make up the target population. Among this group are management personnel, decision-makers in charge of digitization, logistics, and ICT adoption.

Operational staff include drivers, dispatchers, transport coordinators, and IT specialists who work directly on EDI-related tasks. Representatives of the industry and regulatory bodies: Those from organizations and regulatory bodies that promote the digital transformation of logistics. There were 282 responders in the sample. To guarantee proportionate representation of management, operational personnel, and regulators, stratified random sampling was used. Both primary and secondary data were used in the investigation. The following methods were used: Responses are summarized using descriptive statistics, which include means, standard deviations, percentages, and frequencies.

Inferential statistics: regression analysis was employed to assess the predicted impact of EDI adoption on supply chain visibility and performance outcomes, and correlation analysis to ascertain the strength of linkages

## RESULTS

Table 1: Descriptive Statistics of Variables (n = 282)

Variable	Mean	Std. Dev.	Min	25%	Median	75%	Max
EDI Adoption Index	3.52	0.50	2.25	3.25	3.50	3.75	4.75
Visibility Index	2.09	0.41	1.25	1.75	2.00	2.50	3.50
Performance – Efficiency	1.58	0.65	1.00	1.00	1.00	2.00	4.00
Performance – Lead Time	1.63	0.64	1.00	1.00	2.00	2.00	4.00
Performance – Cost Reduction	1.63	0.66	1.00	1.00	2.00	2.00	3.00
Performance – Customer Sat.	1.62	0.72	1.00	1.00	1.00	2.00	4.00
Performance – Competitiveness	1.58	0.68	1.00	1.00	1.00	2.00	4.00
AfCFTA Readiness	2.65	0.76	1.00	2.00	3.00	3.00	5.00

Source: Researcher Fieldwork, 2025

The descriptive statistics of the main factors assessed in the research of supply chain visibility and Electronic Data Interchange (EDI) among Nigerian road transport companies are shown in Table 1. The findings provide crucial information about operational performance, the current level of digitization, and preparedness for the African Continental Free Trade Area (AfCFTA).

Although businesses are using digital platforms to exchange information, the results show that EDI adoption is only modest ( $M = 3.52$ ,  $SD = 0.50$ ), indicating that adoption levels are not yet at their best. This supports the findings of Chong and Bai (2014) and Ngai et al. (2008), who

highlighted that while EDI deployment enhances coordination and openness, it is frequently limited by organizational and infrastructure hurdles. Olarewaju and Adepoju's (2019) findings that Nigerian logistics companies frequently face financial and talent barriers that prevent complete adoption are echoed by the moderate score, which indicates limited integration of EDI. With a somewhat lower mean ( $M = 2.09$ ,  $SD. = 0.41$ ), the supply chain visibility index highlights a lack of transparency, information exchange, and real-time monitoring amongst enterprises. This confirms earlier findings by Kim and Narasimhan (2002), who contended that EDI visibility increases are dependent on auxiliary technologies like GPS and transport management systems and are not automatic. Moldabekova et al. (2021), who reported the continuation of fragmented data flows and manual procedures in emerging countries, are supported by the comparatively low visibility in Nigerian enterprises.

The lower end of the scale is where the performance metrics efficiency ( $M = 1.58$ ), lead-time improvement ( $M = 1.63$ ), cost reduction ( $M = 1.63$ ), customer satisfaction ( $M = 1.62$ ), and competitiveness ( $M = 1.58$ ) are all grouped. These findings imply that the advantages of digitization and EDI have not yet fully materialized into observable market or operational results. Studies like Vial (2019) and Kern (2021) demonstrate that digital transformation can result in significant gains in cost reduction, customer responsiveness, and competitiveness on a global scale. In Nigeria, however, the situation seems to lag behind, most likely as a result of inadequate investment in digital infrastructure, a lack of digital skills, and misaligned policies.

The poor performance results are also consistent with Adeniran et al. (2024), who noted that although digitization lowers e-commerce logistics costs, long-term gains are undermined in the absence of institutional support and personnel upskilling. Remarkably, when compared to other performance metrics, AfCFTA preparedness has a comparatively higher mean score ( $M = 2.65$ ,  $SD. = 0.76$ ). This implies that stakeholders believe they are somewhat in line with the infrastructure and policy requirements of continental trade integration. According to Constantin et al. (2025) and Eke (2025), digital capability and logistical effectiveness have a significant impact on trade openness in developing nations. Therefore, even while Nigerian road transport companies show some level of readiness, the comparatively low score suggests that much more has to be done to bring port-hinterland connection, regulatory frameworks, and digital interoperability into compliance with the criteria of the AfCFTA.

Table 2: Correlation Matrix

Variable	Visibility	Efficiency	Lead-time	Cost Reduction	Customer Satisfaction	Competitiveness
<b>EDI Adoption Index</b>	0.36	0.16	0.13	0.08	0.03	0.17
<b>Visibility Index</b>	1.00	0.07	0.21	0.15	0.17	0.18

Source: Researcher Computation, 2025

The correlation coefficients between supply chain visibility, performance outcomes, and the implementation of Electronic Data Interchange (EDI) are shown in Table 2. The findings shed light on the processes of digital adoption among Nigerian road transport companies by highlighting both direct and mediated linkages.

Supply chain visibility and EDI use have a moderately favorable connection ( $r = 0.36$ ), suggesting that companies who use EDI more frequently have better insight into their logistical operations. According to Chong and Bai (2014) and Di Vaio and Varriale (2020), EDI promotes

transparency by lowering transaction mistakes and facilitating real-time data sharing among supply chain parties. This finding is in line with their findings. Adoption of EDI also decreases order-processing time, which immediately increases visibility and forecasting accuracy, as shown by Ngai et al. (2008). This modest association indicates that although EDI is increasing exposure in Nigeria, its effects are not being fully realized, most likely as a result of organizational and infrastructure obstacles (Olawajun & Adepoju, 2019). Efficiency ( $r = 0.16$ ), lead-time improvement ( $r = 0.13$ ), cost reduction ( $r = 0.08$ ), customer satisfaction ( $r = 0.03$ ), and competitiveness ( $r = 0.17$ ), are the performance metrics with the weakest direct relationships to EDI adoption. The arguments made by Kern (2021) and Adeniran et al. (2024) that workforce training, process re-engineering, and supportive regulatory frameworks must be combined with technology adoption in order to translate into noticeable efficiency and competitiveness improvements are supported by these weak associations, which imply that EDI alone does not ensure immediate performance gains.

It is interesting to note that supply chain visibility and performance outcomes are more strongly correlated than EDI alone. For example, there is a positive correlation between visibility and competitiveness ( $r = 0.18$ ), lead-time improvement ( $r = 0.21$ ), cost reduction ( $r = 0.15$ ), and customer satisfaction ( $r = 0.17$ ).

This confirms Kim and Narasimhan's (2002) conclusion that the relationship between the adoption of digital tools and customer service results is mediated by supply chain visibility. To put it another way, rather than having a significant immediate impact, EDI increases visibility, which in turn leads to performance benefits. These results suggest a mediated relationship in which the key channel by which EDI adoption affects strategic and operational results is visibility.

This finding is consistent with Zhang and Dhaliwal's (2009) contention that visibility lessens interruptions, lessens the bullwhip effect, and eventually boosts competition. However, the modest coefficients indicate that although EDI increases visibility in the Nigerian road transport sector, systemic obstacles like fragmented ICT infrastructure and low digital literacy continue to restrict the full realization of performance benefits (Moldabekova et al., 2021; Ntule, Nkoa, & Fuein, 2024).

Table 3: Regression Analysis

Predictor	Coefficient ( $\beta$ )	Std. Error	t-value	p-value	Interpretation
Constant	0.665	0.182	3.65	0.000	Baseline visibility when predictors = 0
<b>EDI Adoption Index</b>	<b>0.241</b>	0.046	5.21	0.000	Strongest predictor – higher EDI increases visibility
<b>GPS Use</b>	0.062	0.029	2.16	0.032	Significant, but weaker effect
<b>TMS Use</b>	0.100	0.029	3.49	0.001	Moderate positive effect

Source: Researcher Computation, 2025

**Model:** Visibility Index  $\sim$  EDI Adoption + GPS Use + TMS Use

**$R^2 = 0.183$**   $\rightarrow$  Model explains  $\sim 18\%$  of variance in visibility.

**$F(3, 278) = 20.74$ ,  $p < 0.001$**   $\rightarrow$  Model is statistically significant.

The findings of a regression analysis looking at how supply chain visibility is affected by GPS use, EDI adoption, and Transport Management System (TMS) use among Nigerian road transport companies are shown in Table 3. About 18% of the variation in supply chain visibility

was explained by the whole model, which was statistically significant ( $F = 20.74$ ,  $p < 0.001$ ) ( $R^2 = 0.183$ ). According to the analysis, supply chain visibility is most strongly predicted by EDI adoption ( $\beta = 0.241$ ,  $t = 5.21$ ,  $p < 0.001$ ).

This suggests that companies with higher levels of EDI adoption are more likely to experience enhanced data exchange, decreased transaction mistakes, and real-time transparency. The results are consistent with earlier studies by Di Vaio and Varriale (2020) and Chong and Bai (2014), who highlighted the importance of EDI in improving information integration and visibility among supply chain participants. Similar to this, Zhang and Dhaliwal (2009) pointed out that the bullwhip effect is lessened by EDI adoption, allowing businesses to foresee and lessen interruptions through more transparency. This outcome highlights EDI as a key digital tool for integrating disparate data systems and enhancing operational supervision in the context of road transport in Nigeria.

Additionally, the model indicates that visibility is moderately improved by TMS use ( $\beta = 0.100$ ,  $t = 3.49$ ,  $p = 0.001$ ). This implies that businesses that use TMS gain from better scheduling, routing, and shipment coordination—all of which help to improve visibility into delivery timetables and vehicle movements. Similar findings were made by Alesiumiene et al. (2021), who discovered that TMS adoption increases operational efficiency by increasing logistical oversight and decreasing waste. According to this research, firm-level monitoring and visibility improvements are reinforced by complementary technologies like TMS, even if EDI serves as the foundation for inter-organizational data sharing.

Furthermore, there is a minor but noteworthy impact of GPS use on visibility ( $\beta = 0.062$ ,  $t = 2.16$ ,  $p = 0.032$ ). In line with previous findings by Ju, Hou, and Yang (2021) and Ben-Daya, Hassini, and Bahroun (2017), who highlighted the role of GPS in lowering delivery lead times and enhancing reliability, the positive effect emphasizes the contribution of telematics to real-time cargo tracking and driver performance monitoring. According to Moldabekova et al. (2021), the comparatively weaker effect in Nigeria can be the result of unequal adoption among smaller enterprises and infrastructure limitations.

When combined, the regression results indicate that a variety of digital solutions, including EDI, TMS, and GPS, are what drive supply chain visibility in Nigerian road transport companies. This is in line with the Technology–Organization–Environment (TOE) concept (Tornatzky & Fleischer, 1990), which highlights that organizational preparedness and technological capability are essential for effective digital adoption. The results also support the findings of Ntule, Nkoa, and Fuein (2024), who found that when technology adoption is integrated with more general digital skills and organizational practices, it improves performance in Africa.

## CONCLUSION

The study comes to the conclusion that although EDI adoption is moderate among road transport companies in Nigeria, supply chain visibility and performance outcomes are still poor, mostly because of organizational and infrastructure limitations. In addition to increased EDI use, integrating EDI with complementary digital tools and supportive institutional frameworks is necessary to achieve robust visibility and competitiveness.

## Recommendations

- The complete deployment of Electronic Data Interchange (EDI) should be a top priority for road transport companies, and it should be complemented by helpful technologies like GPS/telematics and Transport Management Systems (TMS). Throughout the supply chain, this connection will improve operational efficiency, transparency, and real-time monitoring.
- ICT infrastructure should be reinforced, standardized digital protocols should be enforced, and adoption incentives should be offered by government and industry regulators. In order to improve competitiveness under the AfCFTA, businesses must also invest in worker training to develop the digital skills necessary for efficient use of EDI and related technologies.

## REFERENCES

- Adeniran, A. O., Oyeniran, B., Adeniran, O. O., & Mosunmola, A. A. (2024). Digitization in logistics and its effect on sustainability in Nigeria. *Discovery*, 60(334), 19(2), 15-1420.
- Alesiuniene, K. S., Simanaviciene, Z., Bickauske, D., Mosiuk, S., & Belova, I. (2021). Increasing the effectiveness of food supply chain logistics through digital transformation. *Independent Journal of Management & Production*, 12(6), 677-701.
- Attaran, M. (2020). Digital technology enablers and their implications for supply chain management. *Supply Chain Forum: An International Journal*, 21(3), 158-172.
- Chong, A. Y. L., & Bai, R. (2014). Predicting open IOS adoption in SMEs: An integrated SEM–neural network approach. *Expert Systems with Applications*, 41(1), 221-229.
- Constantin, A., Cetulean, M., Radu, C. G., Dumitra, E. C., & Iacob, A. T. (2025). The impact of digitalisation on supply chain competitiveness: A multi-country comparative approach. *Sustainability*, 17(9), 4038.
- Di Vaio, A., & Varriale, L. (2020). Digitalization in the sea–land supply chain: Experiences from Italy in rethinking the port operations within inter-organizational relationships. *Production Planning & Control*, 31(2-3), 220-232.
- Eke, E. I. (2025). Optimizing cross-border logistics in Africa under AfCFTA. *International Journal of Leadership, Quality Education and African Development*, 2(2), 192-213.
- Fatorachian, H., & Kazemi, H. (2021). Impact of Industry 4.0 on supply chain performance. *Production Planning & Control*, 32(1), 63-81.
- Gupta, H., Kumar, S., Kusi-Sarpong, S., Jabbour, C. J. C., & Agyemang, M. (2021). Enablers of supply chain performance through digitization technologies. *Industrial Management & Data Systems*, 121(9), 1915-1938.
- Haddud, A., & Khare, A. (2020). Digitalizing supply chains: Potential benefits and impact on lean operations. *International Journal of Lean Six Sigma*, 11(4), 731-765.
- Hallikas, J., Immonen, M., & Brax, S. (2021). Digitalizing procurement: The impact of data analytics on supply chain performance. *Supply Chain Management: An International Journal*, 26(5), 629-646.
- Hornyak, T. (2018, June 29). How JD.com is revolutionizing China's logistics with robots and AI. *NBC News*. <https://www.nbcnews.com>.



- Ju, Y., Hou, H., & Yang, J. (2021). Integration quality, value co-creation and resilience in logistics service supply chains: Moderating role of digital technology. *Industrial Management & Data Systems*, 121(2), 364-380.
- Kern, C. (2021). Digital adoption in logistics: Opportunities and barriers. *Logistics Research*, 14(2), 1-15.
- Kim, S. W., & Narasimhan, R. (2002). Information system utilization in supply chain integration efforts. *International Journal of Production Research*, 40(18), 4585-4609.
- Moldabekova, A., Philipp, R., Satybaldin, A. A., & Prause, G. (2021). Technological readiness and innovation as drivers for logistics 4.0. *Journal of Asian Finance, Economics and Business*, 8(1), 145-156.
- Masudin I., Mohamed S. Kamara (2017). Electronic Data Interchange and Demand Forecasting Implications on Supply Chain Management Collaboration: A Customer Service Perspective, *Jurnal Teknik Industri*, 18(2), 138-148.
- Ngai, E. W. T., Chau, D. C. K., & Chan, T. L. A. (2008). Information technology, operational, and management competencies for supply chain agility: Findings from case studies. *Journal of Strategic Information Systems*, 17(4), 411-428.
- Ning, L., & Yao, D. (2023). The impact of digital transformation on supply chain capabilities and competitive performance. *Sustainability*, 15(13), 10107.
- Ntule, M. F., Nkoa, B., & Fuein, E. (2024). Technology adoption and digital skills in logistics performance: Evidence from Cameroon. *African Journal of Transport and Supply Chain Management*, 8(1), 77-91.
- Rengamani.J. (2017). Application of electronic data interchange (EdI) in shipping business: An Empirical Study. *International Journal of Computer Engineering & Technology*, 9(5), 43-50,
- Dike, G. S., & Otto, G. (2024). Vehicles fuel management and service delivery quality among transport companies in Nigeria. *International Journal of Economics, Environmental Development and Society*, 5(4), 511-518.
- Sun, Y., Zeng, X., Zhao, H., Simkins, B., & Cui, X. (2022). The impact of COVID-19 on SMEs in China: Textual analysis and empirical evidence. *Finance Research Letters*, 45, 102211.
- Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books.
- Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118-144.
- Wang, Z., Gao, L., & Wang, W. (2025). The impact of supply chain digitization and logistics efficiency on the competitiveness of industrial enterprises. *International Review of Economics & Finance*, 87, 103759.
- Zhang, C., & Dhaliwal, J. (2009). An investigation of resource-based and institutional theoretic factors in technology adoption for operations and supply chain management. *International Journal of Production Economics*, 120(1), 252-269.