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Relationship between information technology and supply chain visibility of Logistics Firms in Port Harcourt, Nigeria

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Abstract
This study examined the relationship between information technology and supply chain visibility of logistics firms in Port Harcourt, Rivers State. Objectives of the study were to examine how dimensions of information technology such as internet of things and enterprise resource planning relate with supply chain visibility in terms of order visibility and transportation visibility. Using a correlational research design, data were collected from 30 respondents across 15 logistics firms using structured questionnaire designed in four response options. In the course of administering the questionnaires, the researcher was able to retrieve 23 copies. Pearson Product Moment Correlation (r) was used for the test of hypotheses via SPSS Version 25.0. The findings revealed that there is a significant relationship between information technology and supply chain visibility of logistics firms in Port Harcourt, Rivers State. The study concluded that information technology enhances supply chain visibility. Among others, the study recommends that logistics firms should advanced GPS trackers, RFID tags, and smart sensors on vehicles and cargo to ensure accurate real-time monitoring of order status.

Keywords: Information technology, supply chain visibility, logistics firms, Internet of Things (IoT)

Introduction

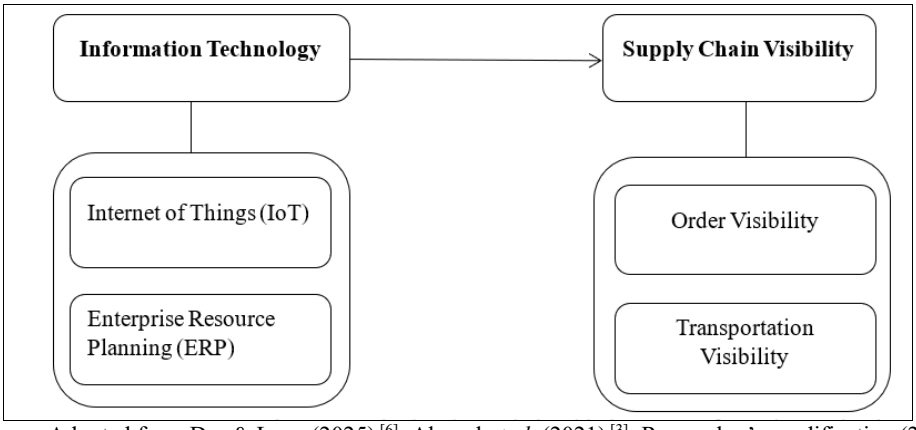
In today's supply chain management practices, enhancing the supply chain visibility particularly for logistics firms is essential as it help them attain their predetermined goals and objectives. Supply chain visibility is the ability of an organization to track, monitor, and access real-time information about the movement of goods, inventory levels, orders, and shipments throughout the entire supply chain. Good supply chain visibility leads to better decision-making, faster responses to disruptions, and more efficient operations (Dar & Lone, 2025; Ahmed *et al*., 2021; Pundir *et al*., 2019) [3, 6, 22]. Supply chain visibility in logistics firms are primarily concerned on how clearly managers and customers see where orders are in the pipeline (order visibility) and where vehicles and consignments are in transit (transportation visibility). High order visibility means firms can track customer requests from placement through picking, loading, dispatch, and final delivery, reducing errors and uncertainty in fulfilment. Transportation visibility extends this transparency to the movement of goods, enabling real-time knowledge of truck locations, estimated times of arrival, delays, and disruptions, which improves deviation management and inbound logistics performance (Kalaiarasan *et al*., 2022; Agrawal *et al*., 2022; Swink *et al*., 2023) [2, 13, 14, 24]. Among others, achieving such end-to-end visibility increasingly depends on information technology.

Information Technology (IT) refers to the use of computers, software, networks, and other digital tools to create, store, process, transmit, and manage data and information. It is multidimensional concept thus has been studied using different metrics (Dar & Lone, 2025; Dewett & Jones, 2001; Grover *et al*., 2024; Panduro, 2023) [6, 9, 21]. However, this study dimensionalized information technology into internet of things and enterprise resource planning.

The Internet of Things (IoT) uses sensors, GPS devices, RFID tags, and connectivity to continuously capture and transmit data on shipment status, location, and condition, turning "dark" assets into smart, connected ones that can be monitored in real time (Ahmed *et al*., 2021; Udeh *et al*., 2024; Pundir *et al*., 2019) [3, 22, 26]. These IoT data streams provide the foundation for predictive logistics, proactive exception handling, and enhanced transparency across complex, multimodal networks (Gunakala, 2025; Ahmed *et al*., 2021; Dhiman & Madan, 2025; Tiwari *et al*., 2024; Pundir *et al*., 2019) [3, 8, 10, 22, 25]. At the same time, enterprise resource planning (ERP) systems and related digital platforms integrate order processing, inventory, transport planning, and financial modules into a single database, enabling holistic, cross-functional visibility of supply chain activities (Gunakala, 2025; Tiwari *et al*., 2024; Novessro *et al*., 2025) [10, 18, 25]. ERP and other digitisation tools are now recognized as key enablers of supply chain visibility because they synchronise physical flows with information flows, support analytics, and facilitate collaboration among supply chain partners (Gunakala, 2025; Tiwari *et al*., 2024; Kalaiarasan *et al*., 2022; Novessro *et al*., 2025) [10, 13, 14, 18, 25].

In global literature, managers increasingly view real-time visibility as a top priority for coping with uncertainty and improving service levels (Kalaiarasan *et al*., 2022; Agrawal *et al*., 2022; Kalaiarasan *et al*., 2022) [2, 13, 14]. For logistics firms operating in Port Harcourt, Rivers State where infrastructure bottlenecks, congestion, and security risks already complicate freight movement, leveraging IoT-enabled tracking and integrated ERP platforms offers a pathway to improve order and transportation visibility, enhance operational efficiency, and support more reliable logistics services in a challenging environment (Ndamati *et al*., 2025; Buhari *et al*., 2025; Moshood *et al*., 2021; Ifekanandu *et al*., 2024) [4, 12, 16, 17]. Therefore, this study examined the relationship between information technology and supply chain visibility of logistics firms in Port Harcourt, Rivers State, Nigeria.

Conceptual Framework



Source: Adopted from Dar & Lone (2025) [6]; Ahmed *et al*. (2021) [3]; Researcher's modification (2026)

Fig 1: Conceptual Framework Showing Relationship between Information Technology and Supply Chain Visibility

Aim and Objectives

The aim of this study was to examine the relationship between information technology and supply chain visibility of logistics firms in Port Harcourt, Rivers State. The specific objectives were to:

1. Investigate the relationship between internet of things and order visibility of logistics firms in Port Harcourt, Rivers State.
2. examine the relationship between internet of things and transportation visibility of logistics firms in Port Harcourt, Rivers State.
3. investigate the relationship between enterprise resource planning and order visibility of logistics firms in Port Harcourt, Rivers State.
4. examine the relationship between enterprise resource planning and transportation visibility of logistics firms in Port Harcourt, Rivers State.

Research Questions

1. What is the "relationship between internet of things and order visibility of logistics firms in Port Harcourt, Rivers State?
2. How does internet of things relate with transportation visibility of logistics firms in Port Harcourt, Rivers State?
3. What is the relationship between enterprise resource planning and order visibility of logistics firms in Port Harcourt, Rivers State?
4. How does enterprise resource planning relate with transportation visibility of logistics firms in Port Harcourt, Rivers State?

Research Hypotheses

The following null hypotheses were tested at a significance level of 0.01.

H_{o1}: There is no significant relationship between internet of things and order visibility of logistics firms in Port Harcourt, Rivers State.

H_{o2}: There is no significant relationship between internet of things and transportation visibility of logistics firms in Port Harcourt, Rivers State.

H_{o3}: There is no significant relationship between enterprise resource planning and order visibility of logistics firms in Port Harcourt, Rivers State.

H_{o4}: There is no significant relationship between enterprise resource planning and transportation visibility of logistics firms in Port Harcourt, Rivers State.

Review of Related Literature

Concept of Information Technology

The concept of Information technology (IT) in an organisation refers to the hardware, software, networks, data and related services used to collect, process, store, transmit and apply information to support work and decision-making. At its core, IT formalises and automates information processing, becoming a critical organizational resource that enables people to execute tasks more efficiently and with greater accuracy (Dar & Lone, 2025; Orlikowski & Robey, 1991; Dewett & Jones, 2001) [6, 7, 20]. By generating information efficiencies, IT reduces the time, cost and errors associated with acquiring, sharing and using data, while information synergies arise when integrated systems connect functions and units so that information can be combined in new, value-creating ways (Grover *et al*., 2024; Dar & Lone, 2025) [6, 9].

Contemporary organisations use IT to support routine operations (transaction processing, inventory control, customer service), management activities (planning, coordination, performance monitoring), and strategic initiatives (innovation, new business models, digital services) (Panduro, 2023; Melville *et al*., 2004; Puri, 2024) [15, 21, 23]. As a design variable, IT shapes organisational structure, enabling greater decentralisation, virtual collaboration, and faster, data-driven decision processes when appropriately aligned with tasks, people and culture (Grover *et al*., 2024) [9]. IT also underpins organisational communication, providing platforms such as email, intranets, databases and collaboration tools that speed up information flows and strengthen internal and external relationships.

At the same time, the organisational impact of IT is not automatic: its value depends on complementary capabilities, leadership, learning, and fit between technology, human users and organisational context (Chew *et al*., 2023; Melville *et al*., 2004; Puri, 2024; Abdu *et al*., 2025) [1, 5, 15, 23]. Poorly implemented IT can create new rigidities, power imbalances or information overload, highlighting the need for deliberate design and change management. Overall, IT has evolved from a back-office support tool to a strategic

enabler that influences efficiency, innovation, communication and competitive performance across the entire organisation (Puri, 2024; Grover *et al*., 2024) [9, 23]. In view of the above, internet of things and enterprise resource planning were used as dimensions of information technology.

Internet of Things (IoT): The Internet of Things (IoT) involves the use of interconnected devices and sensors to collect and transmit data automatically in real time. It enables organizations to monitor physical assets, equipment, and operational activities without manual intervention. Through IoT, firms can track location, temperature, speed, and condition of goods and machines (Dar & Lone, 2025; Ndamati *et al*., 2025; Ifekanandu *et al*., 2024) [6, 12, 17]. This technology enhances data accuracy and operational transparency. IoT also supports predictive maintenance and early detection of system failures. By providing continuous data flow, IoT improves decision-making and process efficiency.

Enterprise Resource Planning (ERP): Enterprise resource planning integrates an organization's core business processes into a single unified system. It enables real-time data sharing across departments such as finance, procurement, inventory, human resources, and operations. ERP improves coordination and communication by providing a centralized database for accurate information access (Dar & Lone, 2025; Ndamati *et al*., 2025) [6, 17]. It also automates routine tasks, reducing errors and operational delays. Through ERP, organizations can enhance planning, monitoring, and resource allocation. The system supports timely reporting and informed managerial decision-making.

Concept of Supply Chain Visibility

Supply chain visibility refers to the ability of managers and partners to access accurate, timely and complete information about goods, orders and logistics activities as they move from origin to final destination (Kalaiarasan *et al*., 2022; Agrawal *et al*., 2022; Swink *et al*., 2025) [2, 13, 14]. It is a key component of modern supply chain management, aimed at making internal and external processes transparent enough to support better planning, coordination and control 9 Kalaiarasan *et al*., 2022) [13, 14]. Visibility involves knowing the status of shipments, inventory levels, capacities, lead times, deviations and risks in a clear and easily accessible way, often via dashboards and reports that allow users to "drill down" when problems occur (Agrawal *et al*., 2022) [2]. In logistics firms, high supply chain visibility improves deviation management in inbound and outbound flows, strengthens prediction and scheduling, and enables faster response to disruptions, thereby enhancing service reliability and overall performance (Kalaiarasan *et al*., 2022; Moshood *et al*., 2021) [13, 14, 16].

Conceptually, visibility is closely tied to information sharing, but it is the outcome rather than the activity: firms achieve visibility when shared data are accessible, reliable and usable across the network. Effective visibility spans supplier, internal and customer domains, covering purchasing plans, supplier capabilities, transport flows, inventory positions and customer delivery status (Agrawal *et al*., 2022; Kalaiarasan *et al*., 2022; Swink *et al*., 2025) [2, 13, 14]. With growing complexity, globalisation and frequent disruptions such as pandemics, regulation and market volatility, logistics organisations increasingly regard real-time visibility as a strategic capability for resilience, risk management and competitive advantage (Kalaiarasan *et al*., 2022; Helo, P., & Shamsuzzoha, 2020; grawal *et al*., 2022) [11, 13, 14]. However, order visibility and transportation visibility were discussed as measured of supply chain visibility.

Order Visibility: Order visibility is the ability of an organization to track and monitor the status of customer orders throughout the entire fulfillment process, from order placement to final delivery. It provides real-time information on order processing, picking, packing, dispatch, and delivery stages. This visibility enables managers and customers to access accurate updates on order progress and expected delivery times (Kalaiarasan *et al*., 2022; Agrawal *et al*., 2022) [2, 13, 14]. Order visibility reduces uncertainty and enhances coordination among supply chain partners. It also helps organizations identify delays and bottlenecks early. By improving transparency and responsiveness, order visibility enhances customer satisfaction and service reliability.

Transportation Visibility: Transportation visibility refers to the ability of a firm to monitor and track the movement of goods in transit across the supply chain. It provides real-time information on shipment location, delivery status, route conditions, and estimated arrival times. Through technologies such as GPS tracking and telematics systems, logistics firms can gain accurate insights into transportation operations (Udeh *et al*., 2024; Pundir *et al*., 2019) [22, 26]. Transportation visibility helps reduce delivery delays, losses, and operational disruptions. It also supports better route planning and fleet management. By enhancing coordination and communication, transportation visibility improves service reliability and customer satisfaction.

Theoretical Review

The information processing theory was used as the theoretical foundation of the study. Information Processing Theory was propounded by Jay R. Galbraith in 1973 as a framework for understanding how organizations manage information to cope with uncertainty and complexity. The theory assumes that organizations operate in environments characterized by varying levels of uncertainty that require effective information handling. It posits that organizational performance improves when information processing capacity matches task and environmental demands (Ndamati *et al*., 2025; Moshood *et al*., 2021; Ifekanandu *et al*., 2024) [12, 16, 17]. The theory further assumes that communication systems, coordination mechanisms, and information technologies enhance an organization's ability to gather, process, and distribute information. Galbraith emphasized that better information flow reduces ambiguity and improves decision-making quality.

The information processing theory is relevant to the relationship between information technology and supply chain visibility in logistics firms as it explains how organizations use information systems to manage uncertainty and operational complexity. Logistics operations involve continuous order processing, shipment movement, and coordination across multiple stakeholders, which generate large volumes of data. The Internet of Things (IoT) enhances information processing capacity by enabling real-time data collection from sensors, vehicles, and tracking devices, thereby improving order visibility and allowing

managers to monitor order status and fulfillment progress accurately. Enterprise Resource Planning (ERP) systems further support information processing by integrating data from procurement, warehousing, transportation, and customer service into a centralized platform. This integration enhances transportation visibility by providing real-time updates on shipment schedules, delivery routes, and transit performance. By aligning information processing capacity with operational demands, logistics firms can reduce information delays, minimize errors, and improve decision-making quality.

Methodology

The study adopted the correlational research design. The population of the study was 15 logistics firms in Port Harcourt, Rivers State. A sample size of 30 managers was purposefully drawn from the population. These managers include operations manager and information technology manager. Data were collected through a structured questionnaire titled Information Technology and Supply Chain Visibility Index (ITSCVI). The questionnaire was designed in four-point likert rating scale format with the following response options: Strongly Agreed (SA) 4, Agreed (A) 3, Disagreed (D) 2, and Strongly Disagreed (DS) 1. The instrument was validated by two production management experts. The reliability coefficient of the instrument (0.71) was elicited using Crombach Alpha. Pearson Product Moment Correlation (r) was used for the test of hypotheses. In the course of administering the questionnaires, the researcher was able to retrieve 23 (77%) copies. A bivariate analysis (test of hypothesis) was done using SPSS Version 25 at 0.01 level of significance.

Results

Ho_1: There is no significant relationship between internet of things and order visibility of logistics firms in Port Harcourt, Rivers State.

Table 1: Correlation between Internet of Things and Order Visibility

			Internet of Things	Order Visibility
	Internet of Things	Pearson Correlation	1	.604**
		Sig. (2-tailed)	.	.000
		N	23	23
	Order Visibility	Pearson Correlation	.604**	1
		Sig. (2-tailed)	.000	.
		N	23	23

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

Table 1 above shows r value of 0.604 at a significance level of 0.00 which is less than the chosen alpha level of 0.01. Since the significance value 0.000 is less than the alpha level of 0.01, the null hypothesis (Ho_1) which states that there is no significant relationship between internet of things and order visibility of logistics firms in Port Harcourt, Rivers State was rejected and the alternate hypothesis accepted. This implies that there is a very strong significant relationship between internet of things and order visibility logistics firms in Port Harcourt, Rivers State.

Ho_2: There is no significant relationship between internet of things and transportation visibility of logistics firms in Port Harcourt, Rivers State.

Table 2: Correlation between Internet of Things and Transportation Visibility

			Internet of Things	Transportation visibility
	Internet of Things	Pearson Correlation	1	.772**
		Sig. (2-tailed)	.	.000
		N	23	23
	Transportation Visibility	Pearson Correlation	.772**	1
		Sig. (2-tailed)	.000	.
		N	23	23

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

Table 2 above shows r value of 0.772 at a significance level of 0.00 which is less than the chosen alpha level of 0.01. Since the significance value 0.000 is less than the alpha level of 0.01, the null hypothesis (Ho_2) which states that there is no significant relationship between internet of things and transportation visibility of logistics firms in Port Harcourt, Rivers State was rejected and the alternate hypothesis accepted. This implies that there is a strong significant relationship between internet of things and transportation visibility of logistics firms in Port Harcourt, Rivers State.

Ho_3: There is no significant relationship between enterprise resource planning and order visibility of logistics firms in Port Harcourt, Rivers State.

Table 3: Correlation between Enterprise resource planning and Order visibility

			Enterprise Resource Planning	Order Visibility
	Enterprise Resource Planning	Pearson Correlation	1	.784**
		Sig. (2-tailed)	.	.000
		N	23	23
	Order Visibility	Pearson Correlation	.784**	1
		Sig. (2-tailed)	.000	.
		N	23	23

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

Table 3 above shows r value of 0.784 at a significance level of 0.00 which is less than the chosen alpha level of 0.01. Since the significance value 0.000 is less than the alpha level of 0.01, the null hypothesis (Ho_3) which states that there is no significant relationship between enterprise resource planning and order visibility of logistics firms in Port Harcourt, Rivers State was rejected and the alternate hypothesis accepted. This implies that there is a strong significant relationship between enterprise resource planning and order visibility of logistics firms in Port Harcourt, Rivers State.

Ho_4: There is no significant relationship between enterprise resource planning and transportation visibility of logistics firms in Port Harcourt, Rivers State.

Table 4: Correlation between Enterprise Resource Planning and Transportation Visibility

			Enterprise Resource Planning	Transportation Visibility
	Enterprise Resource Planning	Pearson Correlation	1	.691**
		Sig. (2-tailed)	.	.000
		N	23	23
	Transportation Visibility	Pearson Correlation	.691**	1
		Sig. (2-tailed)	.000	.
		N	23	23

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

Table 4 above shows r value of 0.691 at a significance level of 0.00 which is less than the chosen alpha level of 0.01. Since the significance value 0.000 is less than the alpha level of 0.01, the null hypothesis (Ho_4) which states that there is no significant relationship between enterprise resource planning and transportation visibility of logistics firms in Port Harcourt, Rivers State was rejected and the alternate hypothesis accepted. This implies that there is a strong significant relationship between enterprise resource planning and transportation visibility of logistics firms in Port Harcourt, Rivers State.

Discussion of Findings

The findings of this study revealed significant positive relationships between information technology and supply chain visibility of logistics firms in Port Harcourt, Rivers State. These findings are in line with the view of Dar and Lone (2025) [6] which emphasized that information technology usage such as internet of things and enterprise resource planning positively influence both supply chain visibility and performance outcomes. In view of the above, the Internet of Things (IoT) enables logistics firms to collect continuous data from connected devices such as GPS trackers, sensors, and smart tags attached to vehicles, containers, and cargo. This real-time data collection improves order visibility by allowing managers and customers to monitor order status, processing stages, and delivery progress with greater accuracy. IoT also enhances transportation visibility by providing live updates on shipment location, route conditions, vehicle performance, and estimated arrival times, which helps reduce delays and improve delivery reliability (Gunakala, 2025; Dar & Lone, 2025; Grover *et al*., 2024) [6, 9, 10].

Enterprise Resource Planning (ERP) systems further strengthen supply chain visibility by integrating data from different functional areas such as warehousing, procurement, transportation, and customer service into a centralized platform. Through ERP, logistics firms can track orders from initiation to fulfillment, improving coordination and minimizing information gaps. ERP systems also support transportation planning and monitoring by providing detailed reports on shipment schedules, fleet utilization, and transit performance (Dar & Lone, 2025; Puri, 2024) [6, 23]. The combined use of IoT and ERP improves information accuracy, reduces operational uncertainty, and enhances decision-making. As a result, logistics firms achieve better transparency, faster response to disruptions, and improved customer satisfaction.

Conclusion

Information technology enhances supply chain visibility in logistics firms by enabling real-time data collection, integration, and information sharing across operations. Technologies such as IoT and ERP improve order tracking and transportation monitoring. They reduce information gaps and operational uncertainty. This leads to faster decision-making and improved service reliability. Conclusively, information technology enhances supply chain visibility.

Recommendations

1. Logistics firms should deploy advanced GPS trackers, RFID tags, and smart sensors on vehicles and cargo to ensure accurate real-time monitoring of order status.
2. Improving network connectivity and integrating IoT devices with central logistics platforms will enable seamless data transmission, which will strengthen real-time transportation visibility.
3. Linking ERP platforms with transportation management systems and real-time tracking tools would enable automatic updates on order status, thereby improving order visibility.
4. Logistics firms should upgrade systems and train staff on regular basis to improve data accuracy and system usage, as such would ensure effective monitoring of transportation activities.

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