opentext™

GUIDE

4 key pillars of digital supply chain tracking and traceability

Contents

Building the foundation for supply chain visibility

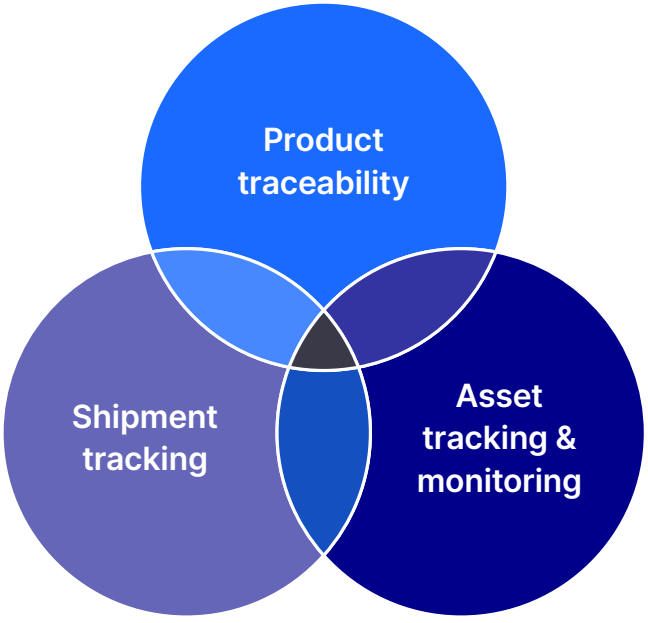
Over the past several years, there has been a slew of reminders—from the global pandemic to war in Europe and from port strikes to collapsing bridges—that global supply chains must be able to withstand many types of disruption.

Therefore, it is no wonder that enhancing supply chain visibility persistently shows up among the top priorities for decision makers. For example, in a 2024 Reuters Events and Maersk survey the top technology investment priorities were supply chain monitoring, tracking and visibility solutions (68%), followed by analytics (51%) and forecasting tools (47%).[1]

Even though organizations have prioritized visibility in their supply chain technology investments, the results have been mixed. According to PwC, 69% of operations and supply chain officers said that their tech investments haven't fully delivered the expected results.[2] In addition, only 12% of supply chain leaders believe that their investment strategy fully meets the needs of their supply chain.[3]

The gap between expectations and actual results raises crucial questions. While it is easy to agree that visibility is essential and we should have more of it, what does this mean exactly? What actions can organizations take to improve visibility, and are some more important than others?

While supply chain visibility is a broad topic and experts often define it in different ways, at its core is the ability to track and trace the movement of physical goods. This includes four key interrelated use cases that form a comprehensive foundation for supply chain visibility: **product traceability, shipment tracking, supply chain asset tracking and monitoring, and predictive analytics**.



1 Reuters Events, *The State of European Supply Chains 2024*, 2024
2 PwC, *Digital Trends in Operations Survey*, 2024
3 Reuters Events, *The State of European Supply Chains 2024*, 2024

"Fonterra uses OpenText Core Product Traceability to enhance food safety and quality by providing consumers with protection against product counterfeits and full traceability of their products."

Case study ›

1. Product traceability

The ability to trace products across the supply chain, from raw material sourcing and manufacturing, all the way to the hands of the consumer—and even beyond to repair, maintenance, disposal, recycling, or repurposing of goods—is becoming increasingly important for organizations.

Regulatory developments drive adoption of traceability solutions

Product safety and sustainability are among the most prominent factors driving developments in this space. For example, the Food Safety Modernization Act (FSMA) in the United States requires businesses involved in handling certain foods to maintain detailed traceability records to enable quick response in case of foodborne illness outbreaks. In the European Union, the Ecodesign for Sustainable Products Regulation (ESPR) is mandating the use of Digital Product Passports (DPP) for a broad range of goods sold in the EU.

The specific technical details required for compliance vary. However, the common denominator is that organizations must be able to trace the products they manufacture and sell throughout their extended supply chain with meaningful granularity. Depending on the type of good, this can mean model, batch, or individual item level tracking, which helps make the regulatory requirements proportionate to the business context.

Product traceability solutions deliver business value across several domains

Beyond regulatory compliance, there are also substantial business drivers for implementing product traceability solutions. Through digitally representing individual products with unique identifiers, organizations can combat problems around counterfeit goods and theft in the supply chain. Unique product identifiers combined with an easily accessible method for consumer engagement—such as QR codes—also help drive new kinds of digital experiences around physical products, including customer loyalty programs, personalized offers, product warranties, digital user guides etc. Additional technologies, such as RFID (radio frequency identification), can help automate tracking of goods as they move through the supply chain, further enhancing the value of the overall traceability solution.

Today, OpenText customers across industries are using OpenText™ Core Product Traceability Service for uniquely identifying and tracking the goods they produce. From baby formula to drinkware and other consumer goods, serialized QR codes and the associated tracking capabilities of the solution are providing a cost-efficient and highly effective method for improving product safety, minimizing recall costs and protecting the brands of companies using it.

2. Shipment tracking

While product traceability involves understanding how goods are moving across the supply chain, its focus is primarily on tracing specific products to verify their origin, perform a recall, investigate potential quality concerns, and so on. In contrast, shipment tracking focuses on managing an organization's inbound and outbound shipments to optimize operations and mitigate business disruptions.

Shipments can be tracked in various ways

Shipment tracking solutions can operate in different ways and provide varying levels of granularity. At its simplest, traditional B2B transactions can be leveraged to provide basic information on shipments. For example, a shipper may inform the recipient with an advance ship notice (e.g. ANSI X12 856) that the shipment is on its way, and the recipient can send a receiving advice message (e.g. ANSI X12 861) to confirm their receipt of goods.

However, to track shipments en route, the advance ship notice contains a shipment number, which can then be linked to data provided by the logistics carrier to get more granular visibility. This can include essential information on the key locations—such as freight terminals and other processing hubs—that the shipment passes through. It could also include real-time or near-real-time information on the shipment location based on telematics data transmitted by the vehicle or vessel that is transporting the goods.

On the most granular level, organizations can track shipments with separate IoT sensors placed in the container or even individual package to provide an uninterrupted real-time view into the location of the goods throughout the entire journey from sender to recipient. The IoT sensors can also provide additional information on the condition of the shipment, such as temperature and acceleration tracking, to ensure the appropriate handling of perishable and fragile goods.

Business context defines requirements for shipment tracking

The different technologies, from IoT sensors to EDI and API integrations with trading partner and logistics provider systems, provide various opportunities for shipment tracking. However, the business context, such as inbound and outbound shipments, types of goods transported, criticality of delays, shipment routes, applicable legislation, industry regulations, and overall business strategy, set limits to what kind of tracking solution is feasible for each organization.

By default, many organizations work with data their logistics carriers provide either directly or through a separate shipment tracking solution. The challenges with this approach tend to relate to coverage and information silos.

In many cases, organizations use multiple carriers, and even a single carrier may use subcontractors for specific legs of their shipment routes. This means that real-time visibility may be only partially available, and only for a subset of all shipments. Additionally, these gaps may extend beyond real-time visibility and leave the organization without any kind of structured information on a significant portion of its shipments.

Even when shipment tracking data is available, it may only be accessible in isolation from related information around order documentation and product details. In addition, access may be limited to specific roles, leaving others unable to benefit from the shipment tracking insights.

OpenText customers are using OpenText Trading Grid for exchanging B2B documents and linking shipment insights with broader Purchase-to-Pay and Order-to-Cash transactions. In addition, OpenText Aviator IoT enables real-time shipment tracking using connected IoT sensors, including shipment condition monitoring and alerting on route deviations, while OpenText Trading Grid Command Center brings all shipment information onto a single data platform to deliver holistic views for different user personas based on their specific requirements.

3. Supply chain asset tracking and monitoring

In addition to digitally representing and tracking shipments and products moving across their supply chains, organizations may need visibility over different types of assets that support and enable their supply chain operations.

Asset tracking covers a broad mix of scenarios

There are many types of supply chain assets. From a tracking and monitoring point of view, one way to categorize these is to look at the dynamics around their usage. Some assets, such as a warehouse building or a packing robot, are stationary. This means that instead of tracking their location, organizations are usually more interested in other variables such as their condition, utilization rate, performance, cycle times, and other information that helps optimize the operations that these assets support.

Other assets involved in supply chain operations, such as warehouse robots, are mobile but stay within the premises of the location that they are assigned to. In this case, any location tracking requirements are likely to be highly specific. For example, users may need to examine where certain assets are moving in relation to an indoor map of a warehouse or other facility. As with stationary assets, for these kinds of assets that remain under immediate control of the asset owner, additional variables such as performance metrics and cycle times are likely to be the primary interest.

Finally, there are assets that either move across the supply chain or otherwise remain outside the immediate custody of the asset owner. These include, for example, shipping pallets and customized tooling equipment that suppliers use to manufacture bespoke components for the asset owner. Other examples could include leased assets and different types of vehicles. For these assets, location tracking is likely among the key interests, as it is essential for minimizing asset loss and optimizing utilization. Depending on the type of asset and the business use case, additional variables may also play a key role.

Asset tracking solutions require a broad set of capabilities

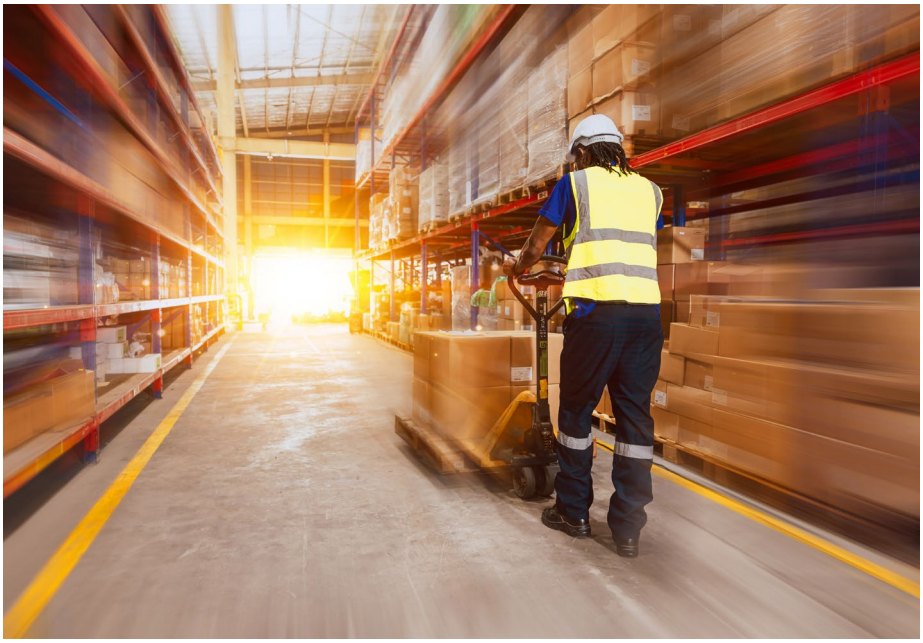
Due to the diversity of assets involved in supply chain operations and the broad range of use cases, technical requirements for holistic asset tracking are broad. For example, a packing robot may automatically capture vast amounts of data by design and make all of it conveniently available via a standard API connection. On the other hand, monitoring a warehouse building can involve connecting with hundreds of individual sensors or packaged IoT solutions from various providers that perform different tasks, from lighting and heating to monitoring and surveillance.

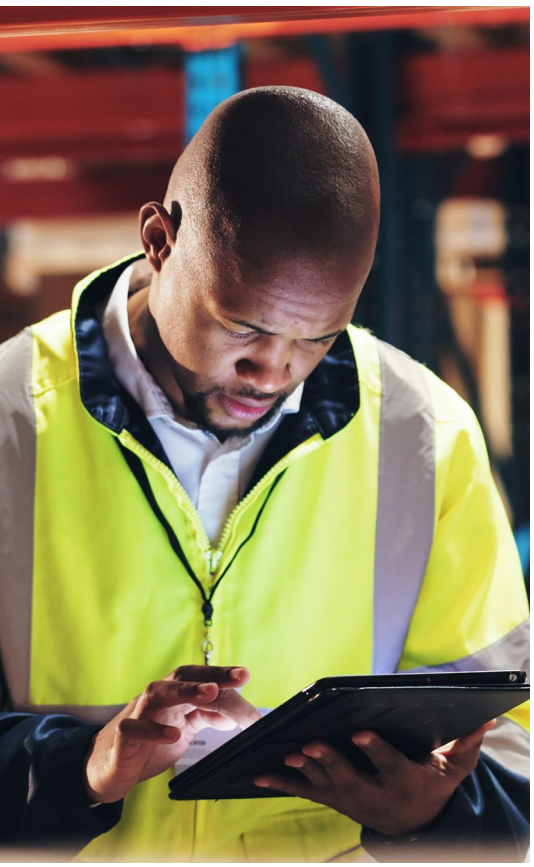
Several solutions are available for different types of use cases, including embedded asset tracking capabilities provided by equipment and device manufacturers. However, weaving the disparate capabilities together to support end-to-end supply chain operations can be challenging.

The main capabilities include the ability to connect with individual IoT devices using common protocols, such as MQTT and AMQP, but also with broader IoT systems and more complex equipment via API integration. Companies also require secure device management in addition to minimize cyber security risks. IoT data also often needs to be aggregated across devices and solutions from multiple specialized vendors and integrated further with business applications to enable meaningful action and automated workflows.

Beyond connectivity and integration, IoT data analytics capabilities and a scalable data platform are needed to support more advanced use cases such as predictive maintenance and scenario modelling. Depending on the use case, custom application development capabilities may also be needed to deliver the IoT insights to end users, such as the operations or supply chain teams.

OpenText customers use OpenText Aviator IoT for supporting various types of asset tracking scenarios from pallet tracking to integrating data from packing robots. The platform provides all the necessary capabilities for supporting end-to-end IoT use cases while focusing on simplifying solution deployment with pre-configured workflows and streamlined device and asset onboarding.





4. Predictive analytics for supply chain operations

In today's global landscape, supply chains are increasingly challenged by disruptions stemming from geopolitical tensions, climate-related events, and labor shortages. Traditional visibility tools, while essential, often fall short in enabling proactive responses to such complexities.

Predictive analytics leverage AI, machine learning, and real-time data analytics to anticipate supply chain disruptions. They enable faster, smarter decision-making in the face of volatility, and streamline supply chain operations.

Anticipating disruptions before they occur

Recent studies highlight the urgency for such capabilities. A 2024 survey by LeanDNA revealed that more than 76% of supply chain executives lack a predictive view of supply and demand, hindering their ability to prepare for major disruptions.

Furthermore, McKinsey's 2024 Global Supply Chain Leader Survey indicated that while companies have made strides in improving supply chain intelligence, significant gaps remain in risk identification and mitigation processes.

Predictive analytics in supply chain operations enable organizations to move beyond reactive measures by forecasting potential issues before they materialize. By analyzing data from IoT sensors, historical trends, and external factors such as weather patterns or geopolitical developments, AI models can identify anomalies and predict events like equipment failures, shipment delays, or demand fluctuations.

For example, in cold chain logistics, real-time monitoring of temperature-sensitive shipments can trigger alerts and rerouting decisions to prevent spoilage. In manufacturing, predictive maintenance algorithms can forecast machinery breakdowns, allowing for timely interventions that minimize downtime. These proactive measures not only enhance operational efficiency but also contribute to customer satisfaction and regulatory compliance.

Beyond prediction: Intelligent response

Beyond prediction, orchestration involves the seamless coordination of responses across various facets of the supply chain. Integrating AI-driven insights with enterprise resource planning (ERP) systems, warehouse management systems (WMS), and transportation management systems (TMS) facilitates automated decision-making processes.

For example, if a delay is anticipated in the delivery of raw materials, the system can automatically adjust production schedules, notify stakeholders, and explore alternative sourcing options. This level of integration ensures that all parts of the supply chain are aligned and responsive to emerging challenges.

Moreover, the adoption of digital twins—virtual replicas of physical assets and processes—allows organizations to simulate different scenarios and assess the impact of potential decisions. This capability is crucial for strategic planning and risk management, enabling businesses to test responses to hypothetical disruptions and refine their contingency plans accordingly.

The imperative for predictive analytics in supply chain operations

The necessity for predictive analytics is underscored by the increasing complexity and interconnectedness of global supply chains. As organizations strive to enhance resilience and agility, the integration of predictive analytics and intelligent coordination mechanisms becomes paramount.

Investments in these technologies not only mitigate risks but also drive competitive advantage by enabling faster, more informed decision-making. As the supply chain landscape continues to evolve, predictive analytics stand as a critical pillar in building robust, future-ready operations.

Conclusion

Supply chain tracking and traceability are increasingly crucial for businesses due to their impact on efficiency, compliance, and resilience. Recent data underscores their importance in mitigating risks and meeting evolving consumer and regulatory demands.

The solutions necessary for a full set of capabilities extend far beyond IoT, but it plays a key role in many use cases. According to a 2024 study by Forrester, 93% of enterprises are either adopting or planning to adopt IoT solutions or applications. However, only 37% say they have adequate in-house staff that can be dedicated to IoT initiatives, and only 35% are convinced of the ROI for IoT.[4]

As the numbers around IoT adoption suggest, supporting and driving value from supply chain tracking and traceability solutions is challenging. But these solutions are no longer operational enhancements but strategic necessities, enabling companies to navigate complex global markets, ensure regulatory compliance, and maintain customer trust.

With its extensive portfolio of supply chain tracking and traceability solutions, OpenText can support organizations on their journey to digitizing their supply chains and achieving end-to-end visibility.

Contact us to learn more about how you can improve supply chain visibility in your organization.

4 Forrester, *The State Of IoT In The US*, 2024

opentext™