



HOW EMERGING TECHNOLOGIES CAN REVOLUTIONIZE FLEET MANAGEMENT

Abstract

Technology can be a game-changer for the logistics industry, giving companies insights into fixed and moving assets along with greater operational visibility. This paper looks at the challenges faced by the fleet management and trucking industry. It explains how the convergence of blockchain, IoT and AI can help organizations observe, track and monitor products, routes, and activities across the value chain.

Overview

Distributed manufacturing has created complex supply chains that extend across multiple geographies. Functions like product design, manufacturing and storage are often located in different countries while the finished products are shipped and sold to global consumers.

During production and delivery, products and their minute components navigate various international borders, weather conditions and handling methods. From an organizational perspective, visibility into location, travel and storage conditions is beneficial for many reasons. Perishable goods are sensitive to climate changes and may require careful handling during transport and storage. Insights such as these ensure lesser wastage and higher profitability. End-to-end supply chain visibility can also track how human labor and other resources are being used, unearthing opportunities for improvement and innovation. However, most manufacturers are yet to deploy technologies that enable such visibility. Currently, many continue to use archaic tools to measure

climatic conditions and have unwieldy systems to maintain records of transit and warehousing. Without integrated solutions, they lack a single authority to verify data accuracy, deliver real-time information and enable timely action.

Some of the pressing challenges faced by the logistics and transportation industry are:

- Paper-centric processes, administration and other operational costs contribute to 20% of the overall costs of transportation.
- Nearly **US \$140 billion** worth of payments are blocked every day in disputes. Companies have to wait for **42 days** before receiving payments for an average invoice.
- A consignment that is shipped internationally may require approvals from up to 30 different **organizations and 200 communication threads**, adding to the complexity.
- Even though the Sanitary Transportation Rule specifies the temperature and duration for which food items can be

stored, industry experts state that as much as **32%** of cargo is loaded and stored in incorrect conditions.

- Pressure, relative humidity, composition, and velocity of the surrounding gas in warehouses contribute to decay in perishable foods, making them unmarketable or inedible with consequential losses.
- Over 90% of logistics companies have **fewer than 6 trucks**, making it difficult for suppliers to find shippers.

These challenges are present due to the lack of collaborative platforms where data such as warehouse conditions, driver credentials and vehicle maintenance records can be shared across ecosystem partners.

An integrated solution, powered by the Internet of Things (IoT) and blockchain, can bring in much-needed transparency for transportation and logistics providers. Such a solution can deliver real-time visibility into the journey of a product along with AI-driven predictive analytics for effective fleet maintenance and safe driver behavior.

The interesting case of reefer containers

A reefer container is a large but portable refrigerator that can be used to transport temperature-sensitive cargo across oceans. This includes edible products like meat, fruits, seafood, fish, dairy, and vegetables. It also includes non-food products like pharmaceuticals, flowers and film.

Reefer containers have bottom air delivery units that dispense chilled air from the floor using a particular T-shaped decking. This ensure that a continuous, uniform and consistent stream of airflow is maintained across the entire shipment. Even in severe climatic conditions, these containers can maintain or lower the temperature of the shipment.



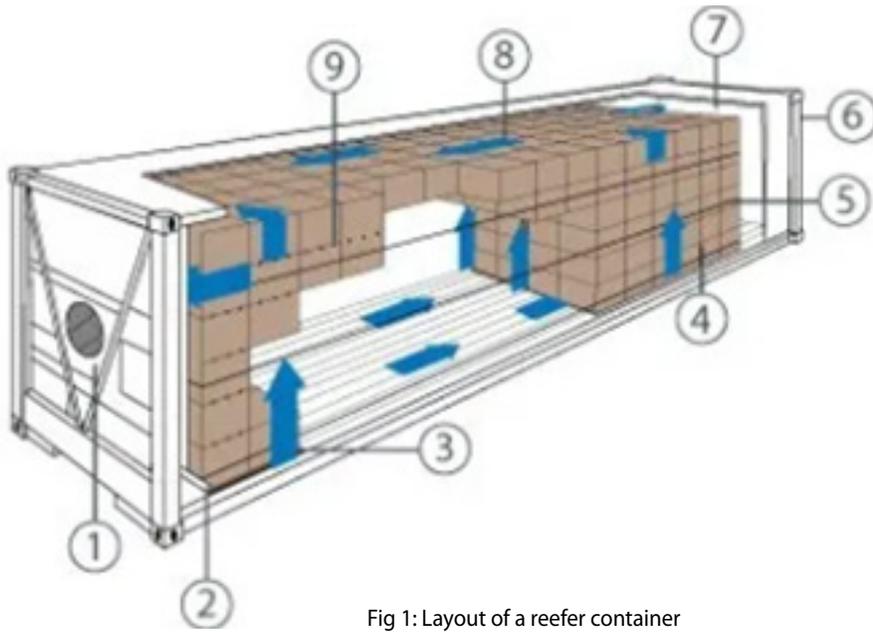


Fig 1: Layout of a reefer container

1	Refrigeration unit
2	Boxes do not extend beyond the pallet
3	Deck board spacing allows vertical airflow
4	Boxes vented for vertical airflow
5	Pallet load is secured
6	Rear doors
7	Air space above cargo
8	Airflow
9	Box vents aligned

While the construction and storage layout of a reefer container ensure optimal airflow to preserve products, technology can help stakeholders track the quality, safety and integrity of the shipment during transport and arrival. Here is an example. Some fruits carry potential pathogens and hence, many countries and institutional customers

mandate cold treatment of the fruit before transport. Such cargo is referred to as 'steri shipments'. The fruit is pre-cooled to a temperature that is lower than what is required by the commercial market and maintained at this temperature during transit. To monitor this, Steri-Probes, which are IoT-enabled temperature probes, are inserted

into the fruit pulp. Typically, three probes are needed per shipment. The probes allow marginal tolerance in temperature variance. If any one of these probes records a temperature difference beyond the preset tolerance level, the entire cargo is rejected due to the possibility of the fruit containing pathogens.



Implementation challenges

IoT sensors can be applied across various transportation assets and fleets to provide accurate tracking and product updates during transit and storage. Organizations must approach such technology enablement in a strategic manner with a clear roadmap that addresses implementation and post-implementation challenges such as:

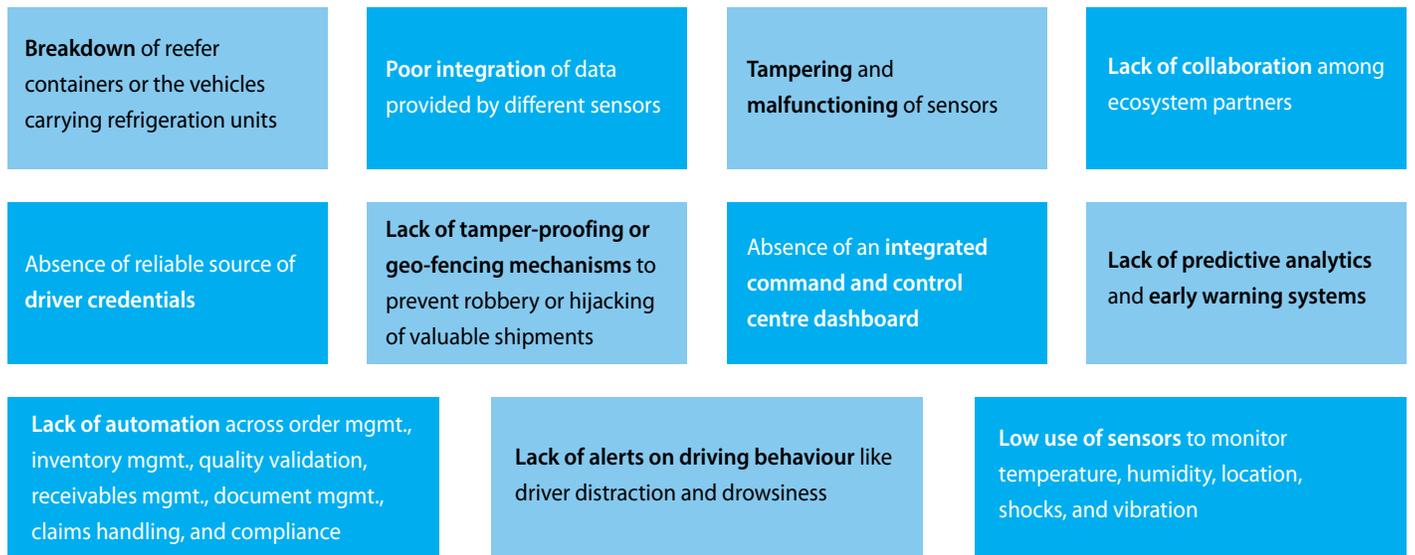


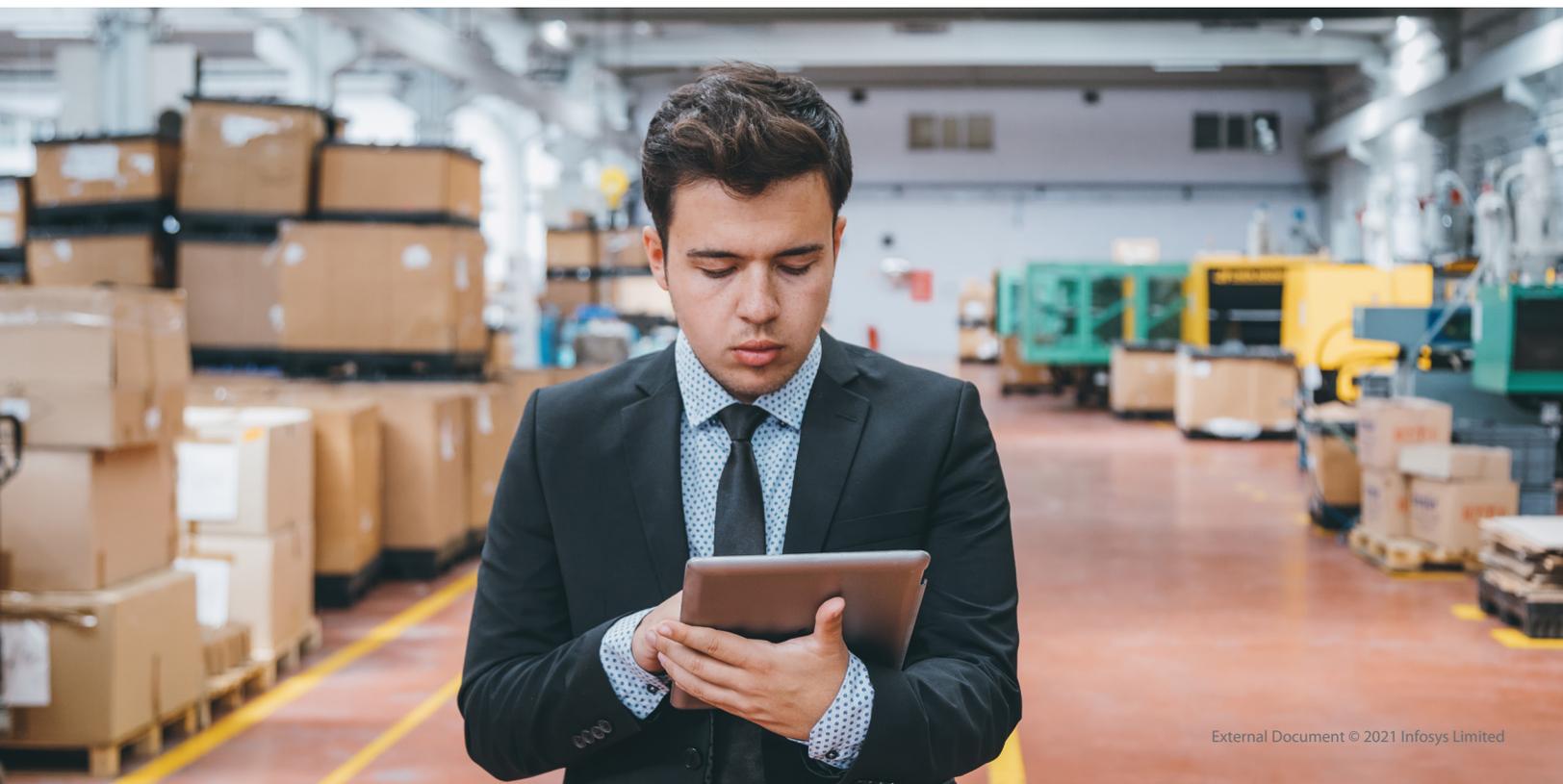
Fig 2: Top implementation challenges of next-gen technology



Application of emerging technologies

The convergence of new technologies like IoT, blockchain and AI gives logistics and fleet management companies access to a wide range of functionalities that drive operational improvements and smart decision-making. Some of these application areas are:

Eliminate paperwork	Blockchain-enabled platforms hosted on the cloud can reduce paperwork by facilitating easy management of digital records or documents
Effective compliance	Smart contracts are blockchain-enabled code that perform an action if certain conditions are met. These accelerate multi-stakeholder approvals and customs clearances, and ensure regulatory compliance, drastically reducing turnaround time
Single source of truth	Blockchain provides immutable, auditable and verifiable data across the ecosystem, helping organizations make the right decisions
End-to-end tracking mechanism	Blockchain and IoT-based solutions, powered with insights from AI, enable scalability to support the demand for faster transportation. These also improve end-to-end supply chain tracking, authentication, integration, and customer experience
Faster onboarding	Blockchain can capture information like driver credentials, data from IoT sensors, condition of truck parts, and the journey of used trucks. With all this information integrated on the blockchain, organizations can quickly onboard drivers and second-hand vehicles
Smart fleet management	IoT enables smart fleet management by giving logistic providers insights around engine idle time, driving speed, vehicle records, and fleet routes so they can perform timely maintenance and optimize routes for asset longevity
Supply chain visibility	IoT sensors coupled with blockchain and AI improve supply chain visibility, warehouse management, inventory tracking, and capacity planning. It also provides predictive analytics
Drones and UAVs for efficient data capture	IoT-enabled drones or unmanned aerial vehicles (UAVs) embedded with cameras and other sensors can add speed and efficiency to data collection, inventory tracking and even last mile delivery
V2V communication	IoT and blockchain together support vehicle-to-vehicle (V2V) communication that allows multiple freight vehicles to communicate and collaborate with each other, thus improving fuel efficiency and safety
Monitor driver behavior	AI can provide non-intrusive, state-of-the-art sensors, and machine learning algorithms for data extraction and modelling to help monitor driver fatigue, distraction and activity in real-time
Increase liquidity in the supply chain	AI and blockchain can significantly reduce supply chain inefficiencies like reducing time taken to get paid for an invoice or claim. This in turn reduces borrowing costs by 75%, increases liquidity by 25%, and enables 2-4% increase in profitability for all stakeholders in the supply chain



Conclusion

Next-gen technologies like blockchain, IoT and AI equip fleet management companies with a variety of capabilities that radically improve operational efficiency and reduce costs. Through IoT sensors, they can maintain a single and real-time record of information that maps product and component journeys through the manufacturing and distribution value chains. This helps identify gaps and improve supply chain responsiveness. When stored on blockchain, such information becomes an immutable record that is easily shared between various stakeholders, driving trust, transparency and effective compliance. Powered by AI insights, fleet management and trucking companies can also get actionable insights on vehicle records, driver behavior and product conditions. By enabling smart decision-making, these technologies help trucking and logistics companies lower asset maintenance costs, improve resource utilization and increase profitability across the supply chain.



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