

TECH INNOVATIONS IN LOGISTICS: TRANSFORMING THE INDUSTRY IN 2024

THE LOGISTICS INDUSTRY, IN THE YEAR 2024, STANDS AT THE FOREFRONT OF TECHNOLOGICAL INNOVATION. WRITES **ANAND PANCHAPAKESAN**, CTO - LOGISTICS BUSINESS, RAMCO SYSTEMS.



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This sector, critical to the global economy, has undergone a significant transformation, propelled by advancements in technology and changing market dynamics. The growing Indian logistics industry was valued at approximately USD 274 billion in 2022 and is anticipated to reach USD 563 billion, achieving a Compound Annual Growth Rate (CAGR) of 9.4 per cent by 2030. In an era where efficiency, cost-effectiveness,

and sustainability are more than just buzzwords, logistics companies are increasingly turning to technology to streamline their operations and enhance customer satisfaction.

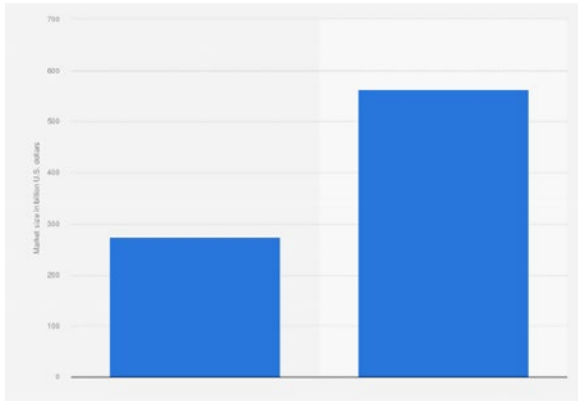
TRANSFORMATIVE TECHNOLOGIES IN LOGISTICS: THE EVOLUTION OF FIRST, MID, AND LAST MILE SERVICES

Transformative technologies have significantly redefined first, mid, and last-mile services, marking a new

era of efficiency and customer-centricity. The advent of network planning and artificial intelligence algorithms has revolutionised hyper local deliveries, enabling logistics companies to optimise routes and reduce delivery times dramatically. One of the innovations that remarkably revolutionised the industry is

FIRST-MILE INNOVATIONS:

The first mile of logistics, which involves collecting goods from producers or



changes. Automated scheduling and pickup systems are now standard, reducing manual intervention and enhancing efficiency. Additionally, IoT-enabled devices are increasingly used for inventory management, allowing for accurate tracking of goods from the moment they leave the production line.

MID-MILE ADVANCEMENTS:

The mid-mile, which typically involves longer distances between warehouses or distribution centres, is witnessing the rise of autonomous and electric long-haul trucks. These vehicles are not only reducing carbon footprints but also streamlining logistics operations. Moreover, AI-driven software for route optimisation and real-time traffic management is minimising delays and enhancing delivery predictability.

LAST-MILE INNOVATIONS:

The last mile of delivery, crucial for customer satisfaction, is where the most visible technological disruptions are occurring. Drones and autonomous delivery robots have started to become commonplace in urban areas, offering a solution to the challenges of traffic congestion and speedy delivery demands.

HYPERLOCAL DELIVERY AND DARK ROOMS:

One of the most notable trends in logistics is the rise of hyper local delivery, especially in densely populated urban areas. Companies in this space are leveraging network planning technologies to optimise the placement and operation of dark rooms. Dark rooms, essentially mini distribution centres, are strategically located to enable rapid dispatch and delivery of goods. The technology

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Emerging Technologies and Their Applications

1 Sustainable Technology

Companies are embracing sustainability and meeting CO₂ emission norms through the adoption of electric vehicles and renewables. These measures generate carbon credits, offsetting costs.



2 Artificial Intelligence and Machine Learning

AI and Machine Learning are transforming logistics by predicting needs, ensuring availability, optimizing routes, and enhancing security for efficient and sustainable operations.



3 The Internet of Things (IoT)

IoT enables real-time tracking, leading to greater transparency and cost savings.



4 Blockchain

Blockchain technology is increasingly being adopted for its ability to provide visibility to all stakeholders, eliminate information asymmetry and enable secure and transparent records, ensuring compliance and authenticity.



5 Automation and Robotics

Robotics and automation are streamlining warehousing operations, enhancing efficiency and reducing manual errors through automated storage and retrieval systems, robotic sorting, pick up and drop off boxes and automated guided vehicles.



6 Cloud Computing and Big Data

Cloud computing and big data analytics are enabling logistics firms to process and analyse large data volumes, improving decision-making and resource management efficiency.



involves sophisticated algorithms that analyse consumer demand patterns, traffic data, and urban geography to determine the optimal number and locations of these dark rooms. This results in significantly reduced delivery times and lower logistical costs.

THE ROLE OF ELECTRIC VEHICLES:

Another key innovation in the logistics industry is the adoption of electric vehicles (EVs), particularly for last-mile delivery. EVs, with their lower operational costs and reduced environmental impact, are becoming increasingly popular. For instance, electric scooters and trucks are now common sights in many cities, delivering everything from groceries to electronics. The shift to EVs is not just a matter of corporate responsibility, but also a strategic business decision. According to NITI Aayog, India has the potential to lower its logistics expenses by four per cent of its GDP, leading to major savings by 2050. Additionally, Electric Vehicles (EVs) offer lower operational costs because of their minimal maintenance needs and the cost efficiency of electricity compared to gasoline or diesel. With the governments offering incentives for adopting green technologies, logistics companies are finding EVs an economically viable option. As we enter 2024, electric scooters and trucks will be crucial for reducing the cost of delivery for the last mile

and are more sustainable for the environment as compared to traditional ICE vehicles.

ADDRESSING THE NEEDS OF ON-DEMAND AGGREGATORS AND SMALL BUSINESS ENTITIES

Logistics companies are increasingly adopting tech-driven approaches and investing heavily in advanced fleet management systems, integrating AI for predictive logistics, and developing customer-centric platforms. This shift not only helps them stay competitive but also enables them to offer more personalised and efficient services.

INTERMODAL TRANSPORT MODELS:

A significant evolution in the logistics sector's interaction with on-demand aggregators and independent small business entities is the adoption of inter modal transport models. This approach integrates different modes of transportation (road, rail, air, sea) to optimise the movement of goods. A typical inter modal operation might involve transporting goods in a large truck from a factory to a rail terminal, then by train to a port, and finally by ship to an overseas destination. This method not only reduces costs but also minimises the environmental impact by utilising more energy-efficient modes of transport over longer distances.

An example of this efficiency can be shown in the transport of goods from Mumbai to Bengaluru. The

goods will be transported from Mumbai through a line haul on a 40-ft. truck, but the person transporting the goods from Mumbai will not enter Bengaluru. They will stop at Nelamangala, which is about 40 km from Bengaluru. The goods will then be transported from Nelamangala to the regional storage locations with seven-tonne trucks. Mini trucks will transport the goods from the regional storage locations to individual houses for delivery, as they can navigate the traffic and get to the last mile, which seven-tonne trucks cannot do. Moreover, instead of having a mini truck carry a full load of inventory around the city, the inventory is split such that the mini truck makes multiple trips but covers the delivery points more efficiently.

DRIVER OPTIMIZATION AND REGULATORY CHALLENGES:

An innovative solution addressing the regulatory challenges faced by truck drivers is driver optimisation. This ensures compliance with legal driving hours while maximising delivery efficiency. For instance, in a scenario where a truck driver can legally drive for a maximum of eight hours, driver optimization technology can schedule driver swaps at predetermined points, ensuring that the truck continues its journey with minimal delays. However, this system is not without its challenges. Issues such as accountability in case of cargo loss or damage, and



the logistical complexities of coordinating driver swaps, pose significant operational hurdles.

THE IMPACT OF ONDC ON LOGISTICS

The Open Network for Digital Commerce (ONDC), initiated by the Indian government, is a ground breaking effort to democratise e-commerce. It aims to create an open, inclusive network that allows small and medium-sized retailers to compete on an equal footing with larger e-commerce giants. The Beckn protocol, which is the backbone of ONDC, enables seamless interaction between various stakeholders in the e-commerce ecosystem, including buyers, sellers, and logistics providers.

The Beckn protocol has a profound impact on logistics, particularly in the realm of last-mile delivery. Facilitating a direct connection between local Kirana stores and consumers has opened up new avenues for hyper local delivery. For instance, a consumer can now order products online and have them delivered from a nearby Kirana store, significantly reducing delivery times and costs. This model not only benefits consumers with faster deliveries but also

provides local stores with a larger customer base.

One of the most interesting developments arising from the ONDC initiative is the collaboration between big-box stores and local kiranas. Large retailers like Amazon and Reliance are now partnering with neighbourhood stores to utilise their local presence for efficient last-mile delivery.

This arrangement allows big retailers to leverage the extensive reach and familiarity of local stores, while kiranas benefit from increased business and access to a broader range of products. This synergy represents a win-win situation, where large and small retailers can coexist and thrive.

As we march ahead into the next phase of developments in 2024, logistics players must adapt to the standardised digital frameworks proposed by ONDC. This involves embracing technologies like block chain for secure transactions, cloud computing for scalable infrastructure, and AI for enhanced operational efficiency.

EMERGING TECHNOLOGIES AND THEIR APPLICATIONS

Emerging technologies are revolutionising the logistics industry, offering innovative solutions, and transforming traditional practices. These technologies collectively represent a significant shift towards a more interconnected, efficient, and innovative future. Some of the technologies that will dominate 2024 will be

THE RISE OF SUSTAINABLE LOGISTICS:

The logistics industry is rapidly embracing sustainability, with a focus on electric vehicles and renewable energy sources. This eco-conscious shift not only aligns with environmental responsibility but also proves cost-effective in the long term. Companies are now vigilant about monitoring CO2 emissions in logistics operations to comply with emission norms. Remarkably, logistics has transformed from a carbon credit black hole to a source, as companies earn financial value from carbon credits. This value serves to offset costs incurred in logistics and supply chain operations, highlighting a dual commitment to environmental stewardship and financial prudence.

Artificial Intelligence and



Machine Learning:

AI and machine learning (ML) are revolutionising the logistics industry, actively responding to dynamic customer demands. Beyond buzzwords, these technologies drive efficiencies across various logistics facets. From predictive analytics for demand forecasting to AI-driven customer service chatbots, they optimise operations. AI refines route planning and load consolidation, reducing fuel consumption, and carbon emissions, and advancing sustainability goals. Additionally, AI enhances security and compliance in logistics. Advanced systems automate risk assessment and fraud detection, fortifying security monitoring and minimising financial losses.

Looking ahead, the

transformative impact of AI and ML in logistics extends to weather-related challenges. In instances of adverse weather conditions, such as heavy rain causing floods in a city, the entire supply chain dynamically adapts. AI predicts affected warehouses, prompting proactive shipment relocation to nearby cities, ensuring critical items reach their destination without first-mile delays. Additionally, for route planning, if a truck is en route to a city with a stop in another city, AI optimises the route to bypass storm-affected areas, effectively saving transportation time. This comprehensive integration of AI and ML not only navigates current operational challenges but also future-proofs logistics,

offering adaptability and resilience in the face of evolving customer demands and environmental considerations.

THE INTERNET OF THINGS (IOT):

IoT technology is revolutionising logistics by enabling real-time tracking of vehicles and cargo. This ensures transparency and efficiency, reducing the chances of misplacement and delays. Additionally, IoT solutions enhance efficiency by optimising routes and schedules, leading to reduced fuel usage. This not only curtails operational costs but also promotes environmentally friendly supply chain operations, underpinning sustainable business practices.

BLOCKCHAIN FOR TRANSPARENCY AND SECURITY:

Blockchain technology is gaining traction in the logistics sector, valued for its ability to establish secure, transparent, and tamper-proof records. In cross-border trade, where compliance and authenticity are paramount, blockchain's adoption becomes particularly crucial.

Its broader application lies in information sharing and track and trace functionality. With a distributed ledger, stakeholders, regardless of location, gain access. For instance, a freight consolidator in Hong Kong records shipping details on the block chain, providing visibility to a clearing and forwarding agent in Kolkata.



This democratisation of data streamlines calculations for arrival times.

Contrasting with the current reliance on Electronic Data Interchange (EDI) documents for stakeholder communications, often challenging for non-corporate agents, block chain offers a user-friendly alternative. Agents, equipped with apps linked to the shared ledger, access accurate, real-time information, simplifying communication processes. Beyond these common uses, blockchain's versatility extends to provenance, reinforcing its role as a transformative force in enhancing transparency, efficiency, and communication across the logistics landscape.

Automation and Robotics: In warehousing and distribution centres, the integration of robotics and

automation is revolutionising operational efficiency. Automated Storage and Retrieval Systems (AS/RS), robotic sorting systems, and Automated Guided Vehicles (AGVs) are minimising manual errors and optimising processes.

An additional innovation in this landscape is the Pick-Up and Drop-Off (PUDO) box system, which acts as a replacement centre. When a field agent orders a replacement part, the PUDO box eliminates the need for a direct meeting with the driver. Instead, the driver drops off the part at a designated slot, triggering an SMS notification to the agent. PUDO boxes, often stocked with commonly used replenishment items, streamline the process. For instance, in the realm of computer hardware, a technician can swiftly retrieve a failed component, such as a

hard drive, from a PUDO box, ensuring a rapid replacement turnaround. This versatile solution, popular in China and gaining traction in ANZ, extends beyond warehouses, serving as extended replenishment centres.

CLLOUD COMPUTING AND BIG DATA:

The use of cloud computing and big data analytics is enabling logistics companies to process and analyse large volumes of data. This enhances decision-making and allows for more efficient management of resources.

The year 2024 marks a pivotal moment in the logistics industry, driven by technological innovations. From advanced network planning for hyper local delivery to the integration of electric vehicles for sustainable logistics, the industry is undergoing a fundamental transformation. These developments not only enhance operational efficiency but also contribute to a more sustainable and inclusive economic ecosystem. For businesses in the logistics sector, staying abreast of these technological advancements is crucial for navigating the challenges and seizing the opportunities of this dynamic market. The future of logistics is undoubtedly bright, marked by innovation, collaboration, and a relentless pursuit of efficiency and sustainability. **CV**

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