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The Impact of Modern Technologies and Methods on the Management of Key Logistics Activities

Утицај модерних технологија и метода на управљање кључним логистичким активностима

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Abstract

Purpose: This paper examines the impact of modern technologies and methods on the management of key logistics activities, with a particular focus on warehousing and transportation. The aim is to assess how innovative logistics solutions contribute to improving the speed, efficiency, safety, and sustainability of logistics operations.

Methodology: The study is based on a review of relevant academic and professional literature, supported by case studies of leading global companies, including Amazon, Alibaba, JD.com, Walmart, DHL, UPS, IKEA, and Alphabet. The analysis covers modern warehousing and transportation technologies, including robotics, automation, artificial intelligence, drones, and Hyperloop solutions.

Findings: The findings indicate that the adoption of modern logistics technologies significantly improves operational efficiency, reduces logistics costs, accelerates order processing and delivery, enhances warehouse space utilization, and contributes to more sustainable logistics systems. At the same time, successful implementation requires substantial initial investments, workforce upskilling, and organizational adaptation.

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Originality/value: The paper provides an integrated overview of the most important contemporary logistics technologies and methods by examining their practical implementation in leading global companies, highlighting their advantages, limitations, and implications for the future development of logistics systems.
Practical implications: The findings may assist logistics managers and decision-makers in selecting and implementing modern logistics solutions to improve competitiveness, service quality, and operational efficiency.
Limitations: The paper is based on a literature review and case study analysis rather than empirical research. Consequently, the conclusions represent a synthesis of existing knowledge and provide a foundation for future empirical studies.
Key words: storage, transportation, innovative technologies, drones, inventory.
JEL classification: L91, M11, O33

Сажетак
Циљ: Овај рад анализира утицај савремених технологија и метода на управљање кључним логистичким активностима, са посебним освртом на складиштење и транспорт. Циљ рада је да сагледа на који начин иновативна логистичка решења доприносе унапређењу брзине, ефикасности, безбедности и одрживости логистичких процеса.
Методологија: Истраживање је засновано на анализи релевантне научне и стручне литературе, као и студија случаја водећих светских компанија, укључујући Amazon, Alibaba, JD.com, Walmart, DHL, UPS, IKEA и Alphabet. Анализиране су савремене складишне и транспортне технологије, укључујући роботизацију, аутоматизацију, вештачку интелигенцију, дронове и Hyperloop концепт.
Резултати: Резултати указују да примена савремених логистичких технологија омогућава значајно повећање оперативне ефикасности, смањење логистичких трошкова, бржу обраду и испоруку робе, бољу искоришћеност складишног простора и унапређење одрживости логистичких система. Истовремено, имплементација ових технологија захтева значајна почетна улагања, развој нових компетенција запослених и прилагођавање постојећих пословних процеса.
Оригиналност/вредност: Рад пружа објединjени преглед најзначајнијих савремених логистичких технологија и метода кроз анализу њихове практичне примене у водећим светским компанијама, указујући на њихове предности, ограничења и потенцијални утицај на будући развој логистичких система.
Практична примена: Резултати рада могу послужити менаџерима логистике и доносиоцима одлука као основа за избор и имплементацију савремених логистичких решења у циљу повећања конкурентности, унапређења квалитета услуге и смањења оперативних трошкова.
Ограничења истраживања: Рад се заснива на анализи постојеће литературе и доступних студија случаја, без спровођења емпиријског истраживања, због чега закључци представљају синтезу постојећих сазнања и могу представљати основу за будућа емпиријска истраживања.
Кључне речи: складиштење, транспорт, иновативне технологије, дронови, залихе.
ЈЕЛ класификација: L91, M11, O33

Introduction

Without the wide application of logistics activities such as storage and transportation, modern human life as we know it today would not be possible. In fact, most of the products we consume have been stored and transported at some point. Storage and transportation help overcome the time and space gap between production and consumption. In previous decades, the global logistics system was continually disrupted by geopolitical crises - such as the COVID-19 pandemic, the Russia-Ukraine war, and the conflict between Israel and Iran - which caused significant delays and spiked transportation costs (Nuševa et al., 2023). However, advancements in methods and technology facilitate the navigation of logistical challenges and contribute to reduced costs. Innovative stock replenishment methods, advanced storage solutions, and modern transport concepts - such as drones and hyperloop capsules – offer significant advantages. These include lower storage and transportation costs, faster replenishment times, faster transportation, safer storage and transportation, and more environmentally sustainable logistics operations.

The first chapter of the paper, titled "Modern Understanding of Storage and Transport", begins by elaborating on the basic principles of storage, such as fundamental stock replenishment models and optimal storage space arrangement. The second part explains the basic modes of transport, covering their common uses, advantages, and disadvantages. The second chapter of the paper titled "Innovative Technologies and Methods of Optimization of Storage and Transport" explains innovative solutions that have been practically applied by companies from different categories such as online trading companies, brick-and-mortar trading companies, large logistics companies and certain global manufacturers of durable consumer goods. In this way, the authors intended to highlight the impacts of implementing modern storage and transport solutions. Specifically, they aimed to define the current standing of modern logistics systems and predict their future development. The aim of this paper is to assess the current state of the modern logistics system and analyze how modern logistics solutions impact service speed, cost, and sustainability, ultimately highlighting proven best practices.

1. Literature Review

The optimization of storage and transport activities is a subject of growing interest among researchers. In recent years, there has been a steady increase in scientific articles addressing optimization of inventory replenishment, warehouse space, and transportation. Seothan states that optimizing warehouse layouts is critical for improving fulfillment efficiency, particularly as e-commerce demand continues to grow. His paper analyzes case studies of successful warehouse optimizations to demonstrate how strategic warehouse design not only improves operational efficiency but also enhances customer satisfaction (Seothan, 2025). Authors such as Ibrahim Mohamud and Abdul Kafi have also analyzed "the role of warehouse layout and operations in warehouse efficiency" aiming to investigate how these attributes affect warehouse efficiency (Mohamud et al., 2023). Then, when it comes to new warehouse technologies, Halawa & Daoud examined the impact of Real Time Location System (RTLS) on the warehouse safety and operational efficiency using data from a US warehouse (Halawa et al., 2020). Mabotja researched the need for automation and robotization in South African steel manufacturing firms. Mabotja emphasized that the enhancement of warehouse operations, particularly through the adoption of formal picking methods, could markedly diminish operational inefficiencies and elevate customer satisfaction (Mabotja, 2025).

Many authors examined technology influence on efficiency through case studies of largest retail companies. Li carried out research on application of AI in Amazon warehouse management. Author concluded that "by leveraging AI algorithms for demand forecasting, inventory optimization, and transportation planning, Amazon has improved efficiency, reduced costs, and increased customer satisfaction" (Li, 2024). Goyal examined the impact of Enterprise Resource Planning (ERP) systems on operational efficiency at Amazon. He aimed to understand ERP's role in Amazon's supply chain and logistics by analyzing its impact on key performance indicators such as cost reduction, order accuracy, and process automation in order to identify potential best practices (Goyal, 2025). In addition, Cao's research focused on optimizing logistics cost management of JD.com. He utilized charts to break down JD.com's logistics costs and identify areas of inefficiency (Cao, 2025). Additionally, numerous other papers examine warehouse and transport technologies. In recent years, many of them have examined the implementation of drone and hyperloop technologies. Doppelbauer (2025) examined the potential of hyperloop tubes for commercial transportation, highlighting their ability to reduce both travel time and costs. However, there are few specific scientific papers that directly compare different warehouse and transportation practices across retail and logistics companies. in the sense that this paper does. Therefore, the authors hope this research will help fill this existing gap.

2. Modern understanding of storage and transport

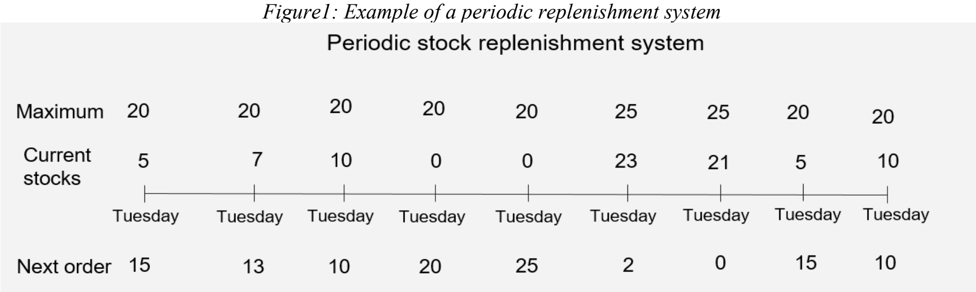
In modern economic theory, logistics activities are considered as inevitable, which must be undertaken in order to overcome the temporal (storage) and spatial (transport) divergence of production and consumption. Since the time and place of production rarely align with those of consumption, logistics is an absolute necessity. However, modern storage and transportation technologies bridge this gap. For example, the widely known "just-in-time" procurement concept allows companies to drastically reduce warehousing as a logistics activity. Developed by Toyota and applied today by Dell, this concept aims to operate without keeping excess stockpiles of inputs (materials, parts, etc.) and outputs (goods, finished products). Ultimately, JIT minimizes inventory holding costs, improves product quality, increases flexibility, and strengthens relationships with suppliers (Ferrer, 2025).

However, the implementation of this concept is demanding. It requires complete data synchronization between the manufacturing plant and input suppliers, with instantaneous updates. Therefore, choosing an adequate ERP system is essential for success. Critics of the "just-in-time" concept state that while the strategy works well for high-value or highly specific products like cars or computers - where consumers are willing to wait – it is nearly impossible to apply to the massive volume of Fast-moving consumer goods (FMCG).

2.1. Modern understanding of storage

Warehousing as a logistics activity includes the design of the physical warehouse and the choice of replenishment methods. Rob O'Byrne believes that any warehouse should be designed to meet the four principles of flow, availability, capacity, and traceability (O'Byrne, 2025). Effective flow allows products to move easily and quickly through the warehouse, which is why many theorists believe a one-way flow is the most efficient design. Availability means easy access to products inside the warehouse with easy maneuvering of forklifts and other storage equipment. Capacity refers to the maximum utilization of warehouse space, while traceability refers to the ability to physically track products in the warehouse in real time. The choice of inventory (replenishment) method usually boils down to choosing between periodic and continuous inventory systems. Under the periodic method, orders are placed at fixed time intervals. The order size is calculated by taking the difference between the amount of product already in inventory and sales from the previous period. ERP in this sense plays a key role by providing these two data. Using a periodic inventory replenishment system, the company restocks its inventory at set intervals (e.g., weekly, monthly, yearly). A continuous inventory replenishment system, on the other hand, utilizes a determined stock threshold to automatically trigger purchase orders (Božić & Aćimović, 2016).

Figure1: Example of a periodic replenishment system



Source: Authors

Figure 1 shows an example of a periodic replenishment system. In this case, the warehouse generates a new order every Tuesday up to the level of 20 units of the product. The quantity of 20 units is obtained based on the historical sales data of the given product. In other words, the potential software would, based on sales from the previous period, determine the level to which the inventory will be replenished. In this case, sales in previous periods were close to, but never exceeded, 20 units. However, on the fourth and fifth Tuesdays, sales reached exactly 20 units, and actual demand likely would have been higher had the product been available in stock. Consequently, a new benchmark of 25 units was set for subsequent periods. A well-designed ERP system should detect such demand fluctuations and respond proactively.

Figure2: Continuous replenishment system

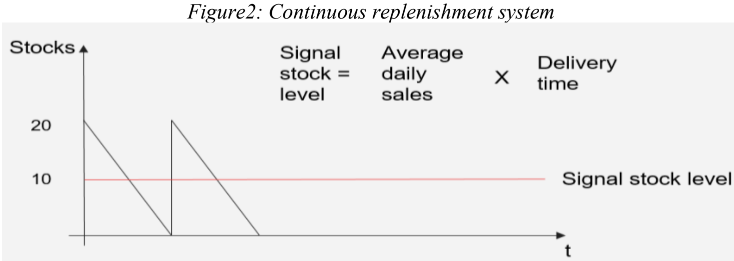


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Figure 2 shows a model of a continuous stock replenishment system. In this model, inventory depletes from a certain initial level (this level is not fixed, but the volume of the order is) over time until it reaches the signal level of stock replenishment. In this case, the level is set at 10 units of the product based on average daily product sales and the time (number of days) for which the supplier can deliver a new quantity of the product. In this case, the ERP system would determine the signal level of inventory by calculating the average daily product sales (or material consumption if it is a matter of production), while the data on the required delivery time of the product (or material) would be manually stored in the software database.

Figure3: Effect of delivery delay on the continuous replenishment model

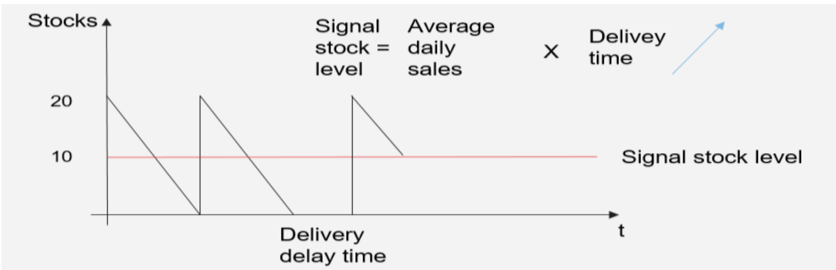

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Figure 3 shows a situation where a supplier of a product or material is late in delivery. Let's take for example the situation where the stock signal level is obtained as follows:

Signal stock level (10) = Average daily sales (5) X Delivery time (2)

In this case, a supplier delay of just one day would mean missed sales of 5 units of product (or missed production of 5 units of product in the case of manufacturing). The software can react in this case by moving the stock signal level to a higher level, for example 15 units or by specifying a larger order volume (the order volume is fixed only in the short term).

Figure 4: Impact of average daily sales growth on the continuous replenishment model

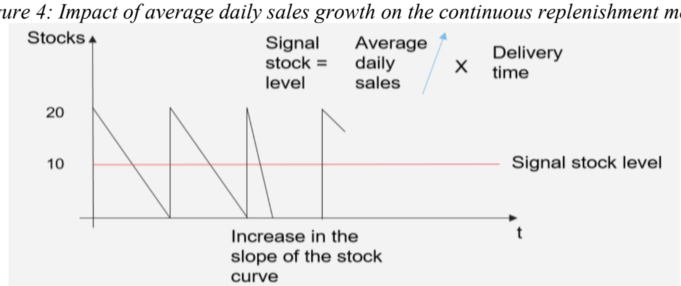

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Figure 4 shows a situation where average daily sales increase significantly between two delivery periods. If the signal level of the stock was obtained in the previously mentioned way (10=5X2), and the average daily sales increased to 10 units of the product in the meantime, then the company is completely out of stock on the first day following the last delivery. Since the company operates for a whole day without inventory, it realizes a missed sale of 10 units of the product.

Significant changes in sales can be influenced by numerous factors, such as advertising campaigns, new trends, changing consumer tastes, and fads. Sometimes these shifts are predictable, but at other times, they are completely unpredictable (e.g., COVID-19 pandemic). Therefore, a company should maintain a certain level of safety stock to prevent such situations. To act more proactively, advanced software solutions can predict consumer trends. For example, the software could anticipate higher demand for canned and frozen fish during fasting days and suggest larger orders of these products. Naturally, this type of prediction requires additional master data that must be entered into the software. On the other hand, the sales are affected by a huge number of factors simultaneously in different directions and with different strength, which makes predictions of this type quite complex. It is impossible to account for every variable. For instance, the majority of residents in our supply areas may not be religious.

2.2. A modern understanding of transport

"Most economic processes, from going to work, through the delivery of raw materials and energy, to the delivery of finished products to customers, are directly related to transport. Transport plays an irreplaceable role in the social sphere. It allows people to meet, communicate and exchange ideas" (Dostal & Adamec, 2015).

The company's transport decisions depend primarily on the type of goods being transported. Table 1 shows the specific characteristics of certain types of transport, detailing the common use, advantages and disadvantages of each.

Table 1: Comparison of the specificities of individual types of transport

Type of transport	Common use	Advantages	Disadvantages
Road	Door to door shipping. Ideal for mixed loads. It is usually used for the first and last stages of transport.	The most flexible form of transport. Relatively cheap.	Limited to continental transport. Subject to traffic, customs and other delays.
Rail	Domestic, continental and intercontinental transportation.	Ideal for mass transport over long distances. Cheaper than air and road transport.	Potentially inflexible routes with limited availability of certain destinations.
Air	Fast transport over long distances.	Fast and safe.	Expensive. Restrictions on weight and size of cargo.

Maritime	Transportation of bulk and heavy cargo. Transportation of cargo that suffers from long delivery times.	Highly standardized shipping containers. Cheaper than air and road transport.	Inflexible routes. Long delivery time. Inflexible shipping times (ships will not wait for missing containers).
Pipeline	Transfer of liquid and gaseous cargo over long distances.	The possibility of transporting basic energy raw materials (oil and gas) to remote locations.	Infrastructure requires constant maintenance. Risks of leaks and endangering the environment. Susceptible to sabotage and terrorism.

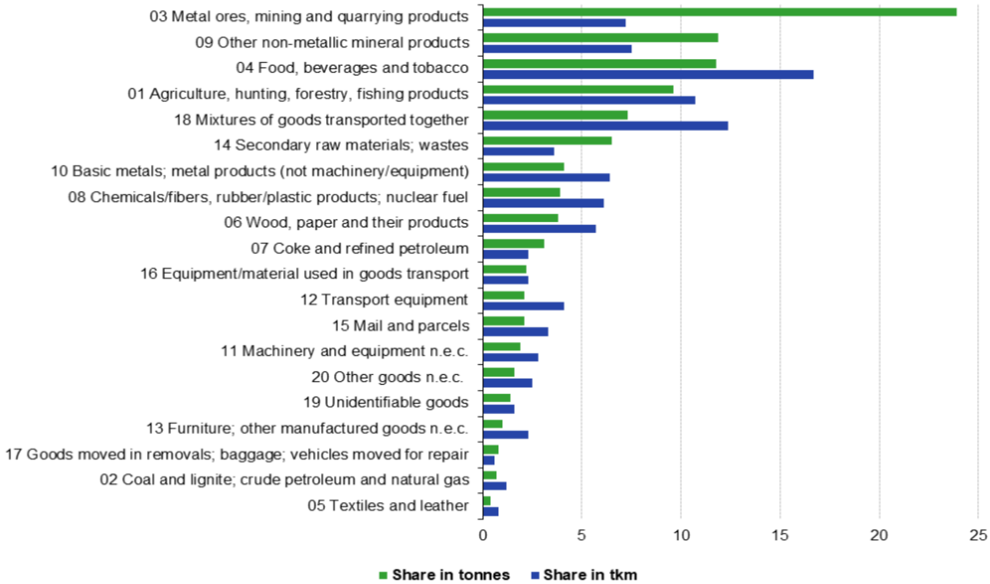
Source: Ivanov & Schonberger, 2017.

These 5 modes of transport are considered traditional and form the basis for transporting most goods. However, a wide array of alternative transportation modes are currently under development, such as drones, hyperloop tubes, and magnetic trains. Some companies, like SpaceX, are considering the possibility of space transport to move goods and people via rockets between different cities on Earth.

According to data from the European Commission for Mobility and Transport, the total number of tkm achieved by all modes of transport in 2020 was 3.76 trillion tkm. European Commission data refer to transport between member states and do not include transport from member states to non-EU countries. The share of road transport was the largest and amounted to 49.9% of all realized tkm, which testifies to the mutual continental connection of these countries and the developed road infrastructure of these countries. Maritime transport had a share of 31.7%, railway 11.1%, river 4.2%, pipeline 3.0%, while air transport had a share of only 0.1% of the total number of tkm (European Commission: Mobility and Transport, 2021).

According to data from the European Commission, the transport and services sector employs 14.2 million people, which is a share of 5.6% of the total number of employees in the Union. The largest share of employees is in land transport with a share of 50% (road, rail and pipeline transport), 2% are employed in air transport, while 5% are employed in maritime and river transport. About 28% of employees are employed in storage and auxiliary transport jobs (loading, unloading, etc.), while the other 16% work in postal and courier companies (European Commission: Mobility and Transport, 2023).

Figure5: The share of certain categories of goods in the transport of the European Union in 2023



Source: Eurostat, 2024.

Figure 5 shows that, in EU transport, the most dominant categories by share of total transported tonnage are "Metal ores, mining and quarrying products", "Other non-metallic mineral products", and "Food, beverages and tobacco". However, when it comes to the share in the total number of tkm, the categories "Food, beverages and tobacco", "Mixtures of goods transported together" and "Agriculture, hunting, forestry, fishing products" dominate. According to Eurostat data, about 1.5 billion tons of food, beverages and tobacco, 127 million tons of furniture and 50.9 tons of textile and leather products were transported in 2023.

3. Innovative technologies and methods of optimization of storage and transport

With the growth of e-commerce - especially since the COVID-19 pandemic - storage and transport systems are evolving rapidly. Global trade and distribution giants like Amazon are implementing a high degree of robotization and automation in their warehouse systems.

For example, Amazon's new distribution center in Shreveport, Louisiana is powered by eight interconnected robotic systems (Greenawalt, 2025). Amazon's "Sequoia" system uses AI and computer vision systems to consolidate inventory and free up warehouse space, thereby facilitating faster order transactions closer to customers. According to some estimates, Sequoia allows Amazon to process orders as much as 75% faster. This system uses robots that transport supplies to employees directly at their workplace in the area between the thighs and chest, thus avoiding the need for the employee to crouch or stand up to reach the product for delivery. According to estimates, this reduces employee injuries by 15% compared to non-robotized warehouses. "Sequoia" uses robots named "Hercules" and "Titan". "Hercules" transports shelves with products weighing about 567 kg (1250 pounds), while itself weighs about 136 kg (300 pounds). "Titan" robots have twice the capacity and are used to transport bulky products such as home appliances or entire pallets of food. In addition to these, Amazon's warehouses also use the so-called "Vulcan pick", Amazon's first touch-sensitive robot with integrated artificial intelligence. This robot easily manipulates products on warehouse shelves and can pick products from the highest and lowest shelf levels. The "Vulcan pick" has been in official use since 2025 and was originally implemented in Germany. "Sparrow," another Amazon robotic system, supports employees who pack items for customer orders. "Sparrow" collects items from the shelves into special boxes that employees will use when packing orders for consumers. After the robot system "Sparrow" delivers the products to the employees, the employees use automatic packaging technology. Automatic packaging enables extremely precise packaging of orders regarding product dimensions, in this way the consumption of packaging material is precisely measured. The automatic packaging system was first launched in Ohio in 2023 and has the capacity to pack up to several hundred thousand orders per week. The system originally made packages from plastic materials, and later that practice was replaced by paper packages in order to implement sustainability factors in distribution. "Robin", Amazon's robotic system introduced in 2022 in Florida, picks up packages and moves them on toward the shipping dock. The entire process is completed by the "Cardinal" and "Proteus" robotic systems. "Cardinal" picks up packages shipped by "Robin" and gently lowers them onto shipping carts that "Proteus" will ship to trucks and other delivery vehicles. Estimates are that the entire robotic system of Amazon will increase the productivity of Amazon's "fulfillment centers" by up to 25%. The introduction of Amazon's robotic systems is not intended to replace employees, but to provide additional support to employees in their daily activities (Greenawalt, 2025).

After Amazon, numerous trade and logistics companies started automating and robotizing their warehouses. Cainiao Network, "Alibaba's" company for optimizing logistics processes, presented a new warehouse concept by opening a fully automated customs warehouse in Hangzhou. This warehouse is supported by autonomous mobile robots ("AMRs") similar to those used by Amazon (such as the "Hercules" and "Titan" robots). In addition to robots, the automation of the storage processes of this warehouse includes a central warehouse management system ("WMS") as well as autonomously guided vehicles ("AGVs"). The technology of this warehouse is especially important during holidays like "Double 11" when additional warehouse efforts are needed in order to process orders (Baker, 2022).

JD.com, another Chinese giant, launched the "Asia No.1" initiative in the first half of the last decade to automate its warehouses in cities, such as Shanghai, Guangzhou, Wuhan and Shenyang. Initially, in early 2018, a warehouse was built in Shanghai with about 200,000 m^2 of storage space, fully automated when it comes to the stages of receiving, storing, sorting and packing orders. The warehouse order processing system uses technology such as artificial intelligence, cloud computing, sensitive sensors, transfer robots, automatic packaging machines and others. This warehouse has the ability to process up to 16,000 orders per hour, with an accuracy of 99.99% (JD.com, 2014). In 2024, JD.com initiated a new project named "Zhilang GTP System" and implemented it at Beijing Airport Garment Warehouse. This warehouse covers 2,500 m^2 of storage space and adopts an integrated modular solution for storage and data collection. The "Zhilang" project was supposed to respond to challenges such as optimization of warehouse space, labor costs and variety of storage units (known as SKU - Stock Keeping Unit). The warehouse is equipped with 7,700 storage containers, supports high storage density and flexible assortment management, which enables a quick return on investment (less than 2 years). The main advantage of this type of warehouse is higher productivity, which is supported by 45 "Zhilang" robots as well as 38 workstations designed for human-robot collaboration. In addition to productivity, this type of warehouse achieves a better optimization of storage space through superior vertical storage solutions that enable up to 2.5 times better compaction of products in the warehouse compared to traditional storage methods. All this contributes to the reduction of storage operational costs and a better flow of products through the warehouse, which results in a higher and faster ROI (Zhang, 2025).

Even brick-and-mortar chains like Walmart are not far behind e-commerce retailers in terms of new warehouse and transport technologies. Walmart has automated a large number of its US warehouses over the past 2 years. A product warehouse in Brooksville, Florida, stands out as an example. In this warehouse, which has been operating since 1991, most of the processes, such as receiving pallets from trucks, were carried out using manual forklifts. Today, this procedure has been completely replaced by automatic robotic forklifts that are controlled remotely. All other processes, such as sorting products, stacking products on warehouse shelves, packing products on pallets for delivery, stretch-wrapping, and loading pallets onto shipping trucks, are also automated. During this process, Walmart made efforts to retain most of the workers who were employed in the warehouse before automation, as evidenced by the fact that out of several tens of thousands of employees, only a few hundred left after the automation process. Most of the employees were offered a certain type of improvement of technical skills in order to adapt to new work positions (through a six-week training). However, employees' perceptions when comparing their old, more manual job with the new one, more mentally demanding job, differ from case to case. Some employees believe that their new job develops their mental skills and benefits them physically. Because they are less exhausted after work, they feel they can spend more quality time with their families. On the other hand, some employees stated that they liked the simplicity of their previous job more and that it allowed them more regular physical activity, which they now have to compensate for in other ways. About 900 employees said they were skeptical about the transition that had taken place in their warehouse, while some even said they were afraid of new technologies and new roles (Gray, 2024).

Some logistics companies, like the German DHL, have also implemented these technologies. DHL is implementing "Edge AI" technology, which includes smart warehouses with AI-powered robots and autonomous vehicles. "Edge AI" technology enables data analysis at the point of origin without relying on cloud servers. In other words, instead of sending data to a remote server, "Edge AI" enables instant data analysis on a specific device. Some of the advantages of this technology include optimized warehouse automation, as robots and autonomous vehicles can process data on-site to reduce inefficiencies in warehouse operations (such as collision avoidance, unnecessary robot movements, etc.), as well as improved cargo monitoring, since sensors that track temperature, humidity, and vibration levels can detect changes that may affect perishable products or equipment. By processing all this data locally, DHL employees can react promptly and proactively without waiting for analysis from the cloud system. A similar technology called "SenseAware" is used by the company "FedEx". "SenseAware" is an advanced IoT system for tracking sensitive shipments especially used to track Covid-19 vaccines during the pandemic. The system monitors the temperature, location and environmental conditions of these shipments and sends this data for processing every two seconds. The main advantage of technologies like "Edge AI" and "SenseAware" is reduced latency, i.e. the time between data collection and the corresponding reaction based on that data (Embedur.ai, 2025).

In addition to giant electronic retailers, large retail chains, and large logistics companies, new technologies in storage and transportation are also being adopted by manufacturers of durable consumer goods. A good example is IKEA, which implemented robotic technology in its warehouse in Zagreb in order to optimize the process. IKEA's small radio-controlled robots for picking up containers loaded with products can store 4 times more products in the same space compared to normal IKEA storage racks. These robots are also energy efficient - for example, ten of these robots consume the same amount of energy as a standard vacuum cleaner (Ingka.com, 2021).

Table 2: Presentation of innovative warehouse and transportation solutions of some of the largest global companies

Company	**Key warehouse and transport innovations**
Amazon	Robotics, drones, Sidewalk IoT
Walmart	Symbotic robotics, AI, drone delivery
IKEA	AS/RS, urban fulfillment, circular logistics
DHL	AMRs, digital twins, green warehousing
Alibaba	Cainiao AI, blockchain
Target	Store hubs, sortation centers
Maersk	Smart containers, digital logistics
Nike	RFID, green fulfillment
McDonald’s	AI forecasting, kitchen robotics

Source: Authors from available data

An increasing number of companies use drones to deliver lighter packages over short or medium-long distances. Commercial drones are capable of transporting packages weighing up to about 2.7 kg at distances of no more than 16 km. Wing, which is owned by Aphabet (Google), has so far made 100,000 drone deliveries in the city of Logan, Australia, carrying food, medicine, coffee, etc. In addition to Wing, companies like Walmart, Amazon, UPS, and Walgreens (which is one of the largest pharmacy retail chains), stand out in drone technology. Amazon Prime Air says it has developed advanced drones that can transport shipments weighing up to 5kg over distances of up to 30km in less than 30 minutes. In this way, even 75% of all Amazon shipments can be transported by drones. Some experts in this field believe that by using drones for the final delivery of packages to consumers, transportation costs would be significantly reduced from about 6 USD for standard delivery methods to about 0.05 USD for delivery by drones (Interestingengineering.com, 2025).

According to experts, drones may be assisted by artificial intelligence in the future; however, such applications are currently restricted to automated acrobatics using drones in the sky at various events. Artificial intelligence would be a potential solution to numerous problems that have already appeared in practice during the commercial use of drones. For example, Alphabet had problems with drone deliveries in Canberra, Australia, as the drones were constantly attacked by crows and other birds. Also, in the early stages of using drones, some companies faced problems with landing drones, as some drones did not distinguish between the water surface of a swimming pool and a solid surface like a lawn. Also, some drones have mixed dogs with people, making delivery more risky, these and similar issues have been cited by Amazon (Interestingengineering.com, 2025). Of course, practice is full of examples of drones hitting electrical infrastructure, poles, trees, and even glass buildings. A good part of these problems could be overcome by the use of artificial intelligence. A drone could use AI to estimate wind speeds, compare them against permitted limits, and proactively assess delivery safety.

Thus, although the potential benefits of drone delivery are great, some consumers have expressed concern about having orders delivered via drones due to fears of product damage, on the one hand, and hacking attacks on the other. Drones are often highlighted as a delivery method due to several advantages, including reduced road congestion and avoidance of urban traffic, a positive environmental impact through lower CO_2 and gas emissions, shorter delivery times (typically under 30 minutes), and a lower risk of package damage (Interestingengineering.com, 2025). In other words, the positive effects of drone delivery are most recognized in megacities, where cross-city travel has become a multi-hour challenge. Nevertheless, it is in large urban areas where drones face the greatest risks, due to the dense concentration of buildings, antennas, and telecommunications infrastructure. When it comes to delivering orders over longer distances, companies like "Zipline" and "Swoop Aero" can serve as representative examples. Since 2020, these companies have been using drones to deliver medicines, vaccines and bags filled with blood to more remote places that do not have a developed road infrastructure. The impact of the "Zipline" project in Rwanda has helped to completely transform the health system in terms of the number of patients whose treatment has been facilitated with the help of drug delivery via drones (Ackerman & Koziol, 2019).

Table 3: Number of commercial drone deliveries from 2018 to 2023

Year	Number of commercial drone deliveries
2018	6.000
2019	34.000
2020	164.000
2021	507.000
2022	874.000
2023	1.044.000

Source: Drones.r.Africa, 2024.

When it comes to drone deliveries, Asia, Africa, and South America stand out as the leading regions by sheer volume of packages delivered. The vast majority of these deliveries were for medical supplies (medicines, vaccines, etc.), FMC products from retail stores, and food from restaurants and cafes, respectively.

Another type of modern transport that is more in the stage of invention rather than innovation is "hyperloop" transport. Hyperloop capsules represent a technology that uses magnetic levitation together with air pressure in order to achieve revolutionary speeds when it comes to transportation. It is estimated that people and goods could be transported in these capsules at speeds of up to 700 miles per hour (1127 km/h). In that case, this transport technology would directly compete with high-speed rail and high-speed air transport, since high-speed rail transport almost never exceeds a speed of 500 km/h (400 km/h in ideal conditions), while commercial flights move at speeds in the range of 885 to 965 km/h. In addition to speed, this type of transport offers several major advantages. First, it completely avoids traffic congestion typical of highways. Second, it alters long-distance cost dynamics, significantly reducing the price per kilometer traveled. Third, it improves safety by operating in an extremely controlled environment free from obstacles and other vehicles. Finally, it is highly energy-efficient because it relies on renewable rather than non-renewable energy sources. The main disadvantage of this type of transport is the limited capacity of passengers and products that can be transported in a single trip. This disadvantage is particularly evident when compared to rail or air transport (Novatr.com, 2023).

A significant number of companies have already started developing Hyperloop projects. The Canadian company TransPod has begun designing Hyperloop tubes that would connect Toronto and Montreal, emphasizing that this mode of transportation would be cheaper, faster, and more sustainable compared to alternatives. For comparison, the company estimated that such a journey would take 45 minutes, highlighting that it currently takes up to 4 hours by plane to cover the same distance (Novatr.com, 2023).

Dr. Josef Doppelbauer, one of the leading researchers on this topic, defines "hyperloop" as "horizontal elevator, with acceleration like a rocket, but without intermediary stops" (Doppelbauer, 2025). In his paper, Dr. Josef cites some intercity routes with estimated transportation times using this new technology as examples of the effectiveness of this technology.

Table 4: Time required for the transport of people and products between certain city routes

Routes	Distance (km)	Time spent in transport (min.)
Bratislava – Vienna	55	5
Dubai – Abu Dhabi	130	9
Helsinki – Stockholm	400	22
Los Angeles – San Francisco	560	30

Source: Doppelbauer, 2025.

The development of "hyperloop" transport technology was initiated by many companies, including "Boring Company", "Virgin hyperloop", "HyperloopTT", the mentioned "TransPod", "Zeleros Hyperloop", "DP World", "Hardt Hyperloop", "DGW Hyperloop" and many others. Led by "DP World" in cooperation with "Virgin Hyperloop", the project aims to build a "hyperloop" system to connect Dubai and Abu Dhabi, with an estimated speed of about 1000 km/h. In cooperation, these two companies carried out the world's first transport of people in the "hyperloop" system at a distance of only 500 meters (Novatr.com, 2023). However, "hyperloop" technology is only in the initial testing phase, and it will take some time before this technology can safely and efficiently transport passengers and products.

Conclusion

By analyzing the logistics practices of the largest trade and logistics companies in the world, we gain insight into the most modern trends in storage and transportation. Robotization and warehouse automation, like that implemented by Amazon or JD.com, will become imperative for the rest of the industry as competitiveness is now built on technology. Will automation and robotization displace labor from warehouse activities?

The answer to this question is both yes and no. A forklift driver as an occupation will probably disappear along with other related jobs, but practice has so far proven that technology almost always creates new jobs. Technologies such as drones or "hyperloop" capsules represent a revolution in transportation, especially in the field of transportation speed, but also in the fields of safety and sustainability. Initial investments in such systems are large and for now belong to the domain of venture capital, but the benefits of successful implementation of these systems are potentially enormous.

New storage systems will enable prevention of shortages, reduction of unnecessary stocks, reduction of breakages and other defects and storage incidents. New transportation systems enable less traffic congestion, less emissions of harmful gases and more efficient transportation. In recent years, there has been a fierce race to implement these solutions, because one thing is clear: a company that succeeds in doing so secures a significant competitive advantage that will be hard to match.

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