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## **Innovative Supply Chain and Logistics Technology Trends**

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In the modern era, the technology boom and the complexity of logistics processes have spawned logistics management software and specialized logistics-focused firms that expedite the movement of resources along the supply chain. Manufacturing companies may choose to outsource the management of their logistics to specialists or manage logistics internally if it is cost-effective to do so [1].

The logistics industry trends are dependent on significant changes that are driven by the implementation of technology-driven innovations in the business processes. The next-generation logistics management solutions are moving towards making the global supply chains more customer-centric and sustainable. Automation in logistics processes brings out a significant increase in productivity and efficiency in the workflow [2]. The improvement of transparency and traceability of the supply chain is vital to maintain a flexible and dynamic relationship between various stakeholders.

Increasing technology innovations are making big waves across industries, and logistics and the supply chain may be one of the most impacted sectors. Notorious for its heavy use of manual processes and large amounts of data stored in different ways and in different places, the logistics industry has perhaps the most to gain from implementing new technologies and following the most innovative Supply Chain and Logistics technology trends.

Recent years have seen massive advancement for the logistics industry in areas like artificial and augmented intelligence, advanced analytics, and automation, to name just a few. These technologies have evolved faster than ever while startups with even newer solutions and innovations continue popping up at a rapid rate. But attached to these innovations are new expectations and standards, forcing logistics companies to either adapt or fall behind. Much pressure comes from customers in the form of individuals and enterprises, all of them are demanding their products or services come faster and cheaper than ever before.

Over the past several years, the logistics industry has started to integrate Artificial Intelligence (AI) solutions including intelligent transportation, route planning, and demand planning in their operations — but this is only just the beginning. From last-mile delivery robots and sustainability solutions, to warehouse automated picking systems and predictive optimization software, AI is already making a huge difference in logistics [3].

This can be seen in a number of logistics applications. While trucking, rail and ocean freight have been tracked by satellite via telematics for decades, and versions of electronic driver logs have been around for nearly 20 years, the data has not been properly utilized until now. Previous tracking efforts did not provide «clean» data and had been regularly stored on paper, making proper analysis more difficult. The difference today, however, is not only the presence of more data but also vastly more powerful computing and algorithms to sort, evaluate and result in action. Along with AI, Augmented Intelligence is also expected to spike in use. Augmented intelligence combines human intelligence with AI automated processes.

Three driving trends are paving the way for AI's current boom: cheaper, better computing power, the ever-increasing

usability of Big Data, and improved algorithms [4]. These forces continue to culminate in more powerful AI applications, providing present and future applications which intrinsically alter what is possible in logistics. Much like the agricultural revolution, the digital revolution is impacting many different aspects of modern life – and logistics is one of the industries primed for disruption. It is beginning its journey to become an AI-driven industry – but the future remains rife with challenges to overcome and opportunities to realize.

Digital twins are possibly one of the most exciting logistics technology trends to keep an eye on. As many logistics professionals know, products are never exactly the same as their computer models. Modeling in its current state doesn't take into account how parts wear out and are replaced, how fatigue accumulates in structures, or how owners make modifications to suit their changing needs. However, digital twins technology is changing this once and for all. Now, physical and digital worlds can be melded into one, thus allowing us for the first time to engage with the digital model of a physical object or part just like we would with their physical counterparts.

The potential use cases for digital twins in logistics are vast. In the shipment sector, digital twins can be used to collect product and packaging data and use that information to identify potential weaknesses and recurring trends to improve future operations. Warehouses and facilities can also use the technology to create accurate 3D models of their centers and experiment with layout changes or the introduction of new equipment to see their impact, risk-free. Furthermore, logistics hubs are able to create digital twins and use those to test out different scenarios and increase efficiency. In addition to that, delivery networks could use the technology to provide real-time information that will improve delivery times and further aid autonomous vehicles in their routes. It will be interesting to

see what other impactful logistics use cases develop over the next year [5].

One can't speak about supply chain visibility without also mentioning IoT (Internet of Things) sensor technology, a crucial asset for tracking shipments. Connected IoT devices on parcels allow warehouses to track inventory, vehicles, and equipment through cloud services. At the same time, the container management powered by IoT also becomes easier through real-time monitoring, increasing fuel efficiency, implementing preventative maintenance and making container operations proactive instead of reactive.

Since its advent in 2008, blockchain has grown to become one of the biggest buzzwords in any industry as well as one of the most overhyped logistics technology trends [6]. However, the complicated concept of the blockchain has been difficult to grasp for the general public, and despite its strong potential for incredible use cases both in and outside of the logistics, there's been an overall lack of real development. This has led blockchain to become extremely overhyped and logistics professionals to feel fatigued from the term's overuse.

But it's not just new technology shaping the future of logistics. It's also emerging business models and new industry players. Often driven by startups, new systems incorporating elements of the sharing economy are gaining prominence fast. Without the need for a rich asset background, startups tend to focus on the «asset-light» parts of the value chain, for example by turning into digital freight forwarders.

With more flexible operations, they can offer more agile pricing and provide quotes faster, while championing transparency [7]. This is the case for Uber, which launched its Uber Freight feature in the US in 2017 and has expanded to Europe and Canada this year in pursuit of a more effective global freight marketplace. Amazon has also announced its

new robotics products heading to its hundreds of fulfillment centers around the world.

Sustainability is a trend that has been cutting across industries and logistics is no exception. Last-mile delivery, in particular, is traditionally a very time- and energy-consuming, which is also why it presents many opportunities for fresh and smart approaches. To lessen the negative environmental impact, companies leverage a plethora of technologies, from actual electric vehicles to AI-based software that calculates the route with the lowest generated emissions.

Similar logistics technology trends can be seen across the entire shipping sector. Just recently, over 60 commercial groups, including Maersk, launched an initiative that aims to use ships and marine fuels with zero carbon emissions on the high seas by 2030. These efforts are fundamental not only due to their direct impact but because they inspire the whole industry to adopt a more sustainable mindset. Even though autonomous vehicles, be it trucks or drones, have become closely associated with the close future of logistics, we are still likely to see it in only its trial stage throughout the next year [8].

Whether it's wearable technology, driverless vehicles, or multifunctional robots, robotization can significantly improve the efficiency and speed of warehouse processes. With machine-learning technologies and sensors ensuring extreme accuracy and easy traceability, the modern warehouse will start seeing the inclusion of many more autonomous robots.

Just a few short decades ago, it was nearly unimaginable that we could ever turn vast amounts of data into actionable information for logistics providers around the globe. But fast forward to today, and data has become the cornerstone of any modern logistics operation. Improved operational efficiency, last-mile and real-time route optimization, strategic network and capacity planning, customer service improvement and

more product innovation are just a few of the major benefits now easily produced by a data-driven business [9].

There are both pros and cons that come with this access to massive quantities of information. While this data has the potential to inspire exciting business transformation, it's often more difficult for logistics organizations to sort through it to discern what's useful and what's not. If your company has piles of data in various formats and systems which aren't being used to create actionable insights, its storage will only become useful when a data-driven solution is implemented later on. This is why many organizations are starting to rely on industry data standards, which dictate how data should be recorded, stored, and shared. Standards may vary by industry, but the governing principle is that any crucial information must be exchanged in a common format that makes collaborating and extracting insights simple and straightforward.

Unfortunately, across the industry, logistics data standards have yet to become a common practice. The lack of industry data standards complicates the exchange of information, which in turn limits innovation by providing an incomplete picture of issues that may be affecting logistics companies. For example, maritime freight shippers have cited a lack of common data standards as a major industry problem, making it more difficult to conduct business between carriers. Container shippers have also recognized the need for standardization in their industry.

Despite the best efforts of data standardization organizations, a great deal of work remains to be done. Fortunately, because data standardization already plays a significant role in nearly every other major industry, it seems inevitable that logistics providers will eventually agree on a set of universal data standards. The opportunities presented by AI, blockchain, and IoT are simply too valuable to pass up, and while the path to widespread adoption may be challenging, it's

certainly a problem worth solving in order to deliver next-generation insights and performance.

Once companies have good quality standardized data, it unlocks all kinds of opportunities for predictive optimization in logistics to achieve much higher levels of operational efficiency. With that in mind, Logistics providers seeking greater efficiency and collaboration should continue taking small steps of their own to embrace data standards and build an industry more powerful than ever before.

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