IOT ANALYTICS
MARKET INSIGHTS FOR THE INTERNET OF THINGS

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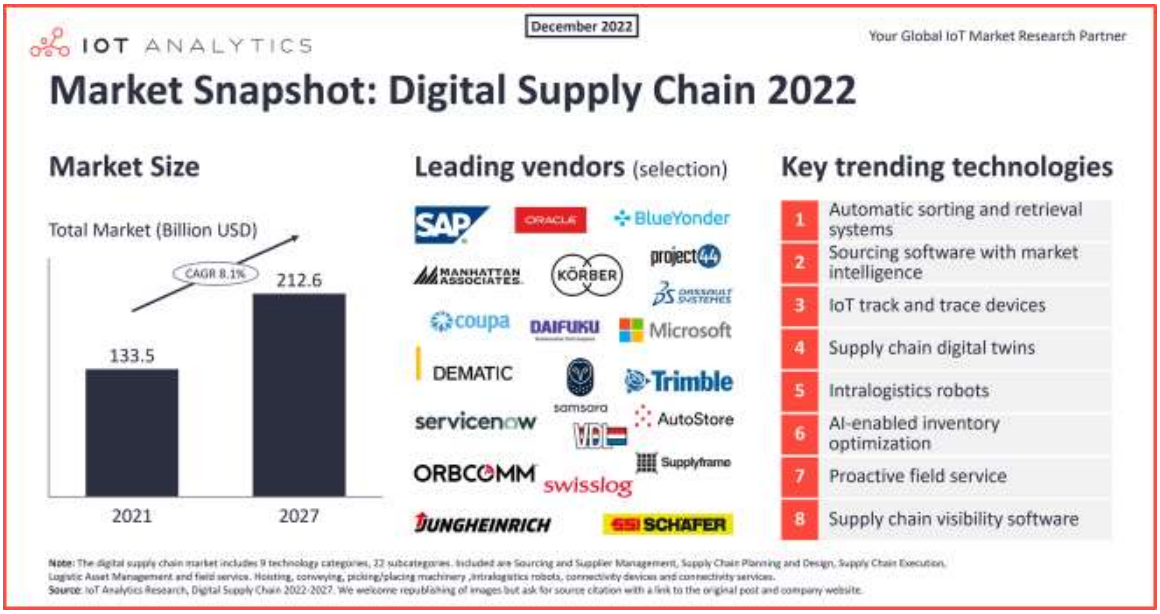
INSIGHTS RELEASE

8 key technologies transforming the future of global supply chains



Hamburg/Germany, December 15, 2022: IoT Analytics, a leading global provider of market insights and strategic business intelligence for the Internet of Things (IoT), AI, Cloud, Edge, and Industry 4.0, today published a 252-page market report detailing the market for digital supply chains. This research includes market projections for nine key market segments, estimated market share of key vendors per segment and sub-segment, an analysis of macro factors influencing the market, a number of digital supply chain implementation examples, and some of the most important trends & challenges.

Key insights:

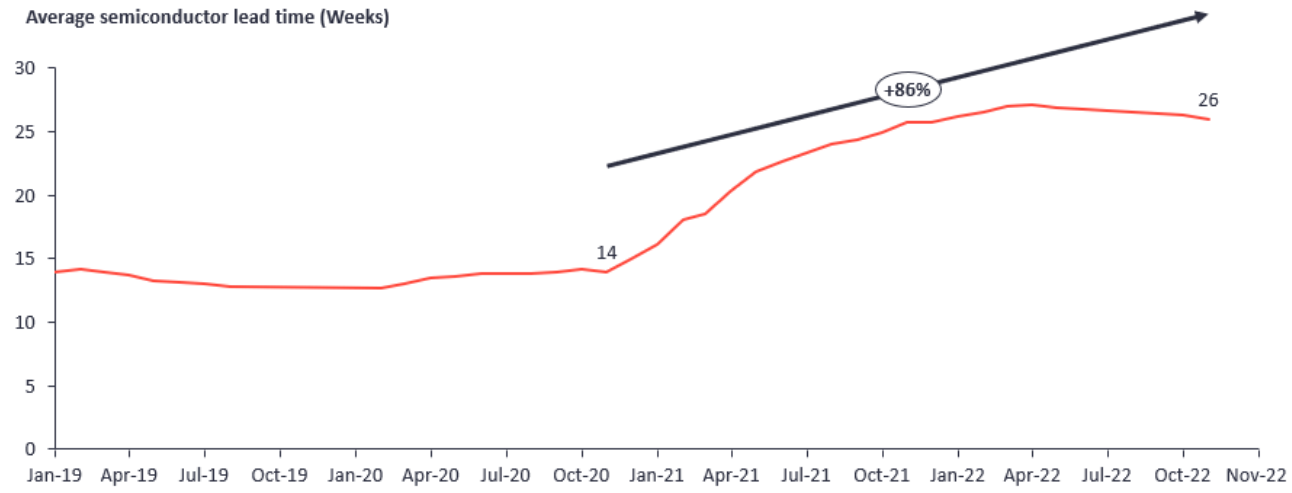
- **The Digital Supply Chain market is starting to accelerate according to new research by IoT analytics.**
- **Eight supply chain technology innovations are helping to make global supply chains more robust, including AS/RS technology, intralogistics robots, IoT track and trace, AI-enabled software, and supply chain digital twins.**

Knud Lasse Lueth, CEO at IoT Analytics, says: "*With supply disruptions now going into its third year, companies realize that they need a better handle on where their goods are, what their suppliers are doing, and how to expedite delivery to customers. Cloud, AI, IoT and robotics innovations are making inroads into this segment that a few years ago was frowned upon because it was seen as not very strategic to most companies*"

Matthieu Kulezak, Senior Analyst at IoT Analytics, adds: "*There is now more attention on digital supply chain technologies than there was before the pandemic. We see a number of large Fortune 500 companies like Nike or The Kraft Heinz Company making major investments into wide-scale supply chain digitization to make their supply chains more resilient*."

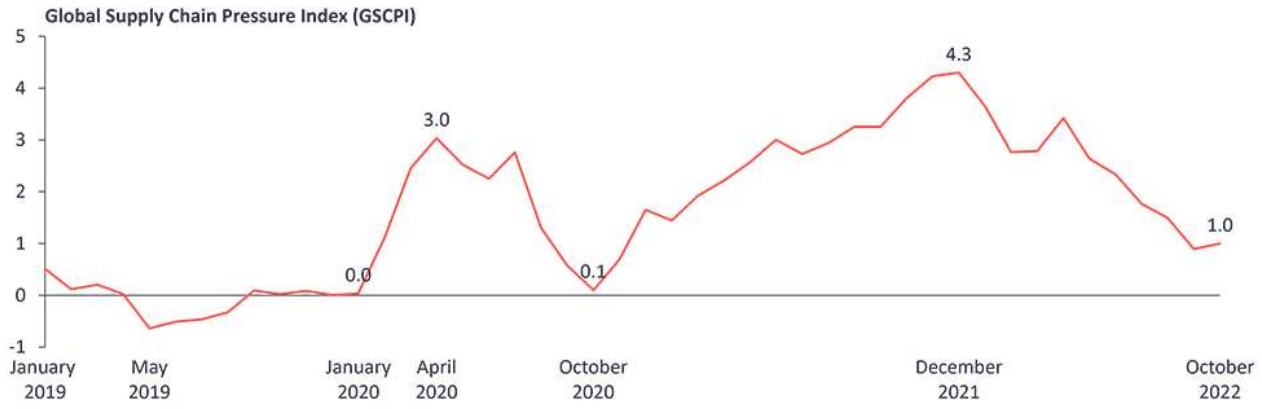
The current state of supply chain disruptions

26 weeks (or half a year)—that is how long companies have to wait on their semiconductor orders right now, on average. In some cases, much longer.



Source: Bloomberg

Prior to the current supply shortage, the average had been approximately 14 weeks—significantly shorter.
Nonetheless, in general, global supply chain disruptions are easing. The Global Supply Chain Pressure Index (GSCPI) peaked in December 2021 and has since fallen with the latest reading of 1.0, indicating a much-improved situation, but still above the long-term average of 0.



Source: Federal Reserve Bank of New York, Global Supply Chain Pressure Index

Some companies are managing supply disruptions better than others

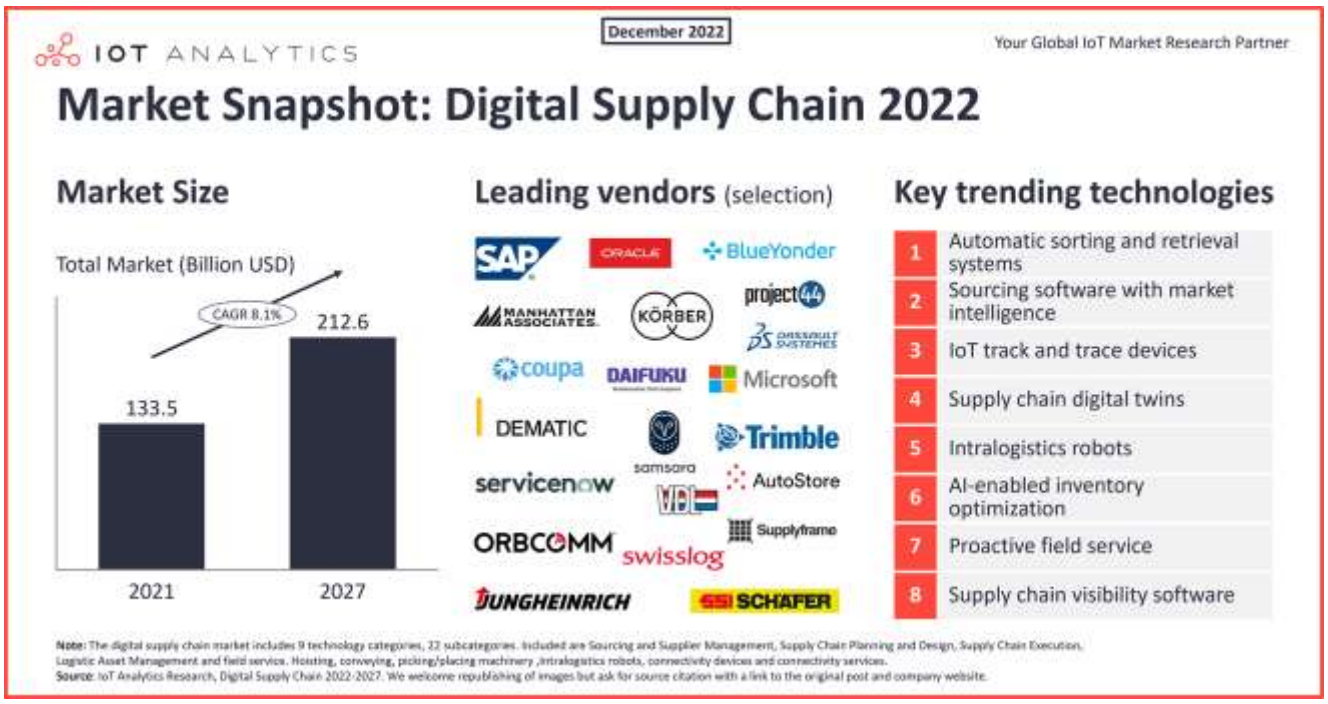
When ports are congested, suppliers halt their production, or containers are missing, there are only limited things a company can do to ensure supply chain operations are smooth.
The last two years have shown that one of the most effective measures a company has at its disposal is investing in a connected, digital supply chain. It helps to gain supply chain visibility, improve planning, and improve execution—all with the goal of ensuring that customers receive the right products on time.

Consider the example of US-based fashion manufacturer and retailer **Nike**: The company invested in state-of-the-art supply chain technology shortly before pandemic-related disruptions started. Nike ended up navigating the pandemic better than some of its competitors whose supply chains were not as digitized. One of Nike's investments was the acquisition of Sales and Operations planning software vendor Celect in August 2019. The software tool, which provides advanced demand predictions and inventory reallocation, helped Nike anticipate the drop in sales in physical shops during the 2020 global pandemic and rebalance its inventory to warehouses dedicated to online shopping. As a result, **Nike** managed to adapt its supply chain to the shift in consumer behaviors linked to the global pandemic.

"*With the Celect acquisition, where we're able to forward deploy inventory to where we were able to predict demand reliably enough, so that it's within one to two day ground shipping to a large number of consumers across the country.*"
John J. Donahoe, CEO at Nike (Q1 2021)

The Nike digital supply chain contributed to the company's success in recent years. In both 2020 and 2021, Nike outgrew its core competitor, Adidas, by a wide margin (8 percentage points difference in 2020 and 10 percentage points difference in 2021).

The Digital Supply Chain Market 2022



With supply chain disruptions having dominated CEO discussions for the last one and half years (see for example: What CEOs talked about in Q3/2022), many enterprises are following the example of Nike and are making supply chain technology investments a priority in 2022 and going into 2023. IoT Analytics latest 252-page market research report titled **Digital Supply Chain Market Report 2022–2027** takes an in-depth look at the investments companies are making across a wide variety of supply chain technologies, including topics such as sourcing software, supply chain visibility software, IoT-based track and trace, and warehouse automation technologies. The market is expected to enter a multi-year investment cycle, growing from $135B in 2021 to $217B in 2027 at an annual growth rate of 8.1%—this compares to a growth rate of 4.5% for the four years preceding 2021.
In this article, we highlight eight upcoming technologies we came across during our research that will define the next era of digital supply chain as companies try to ensure their supply chains become more resilient, automated, and predictable:

8 upcoming supply chain technologies

1. Automatic sorting and retrieval systems (AS/RS)

A. Technology overview

AS/RS is a relatively novel type of intralogistics machinery. It replaces conveyors, forklifts, and racks, which are traditionally used to move items around a warehouse into a single, cubic system. This system puts away, stores, and retrieves items automatically.

B. How it improves supply chains

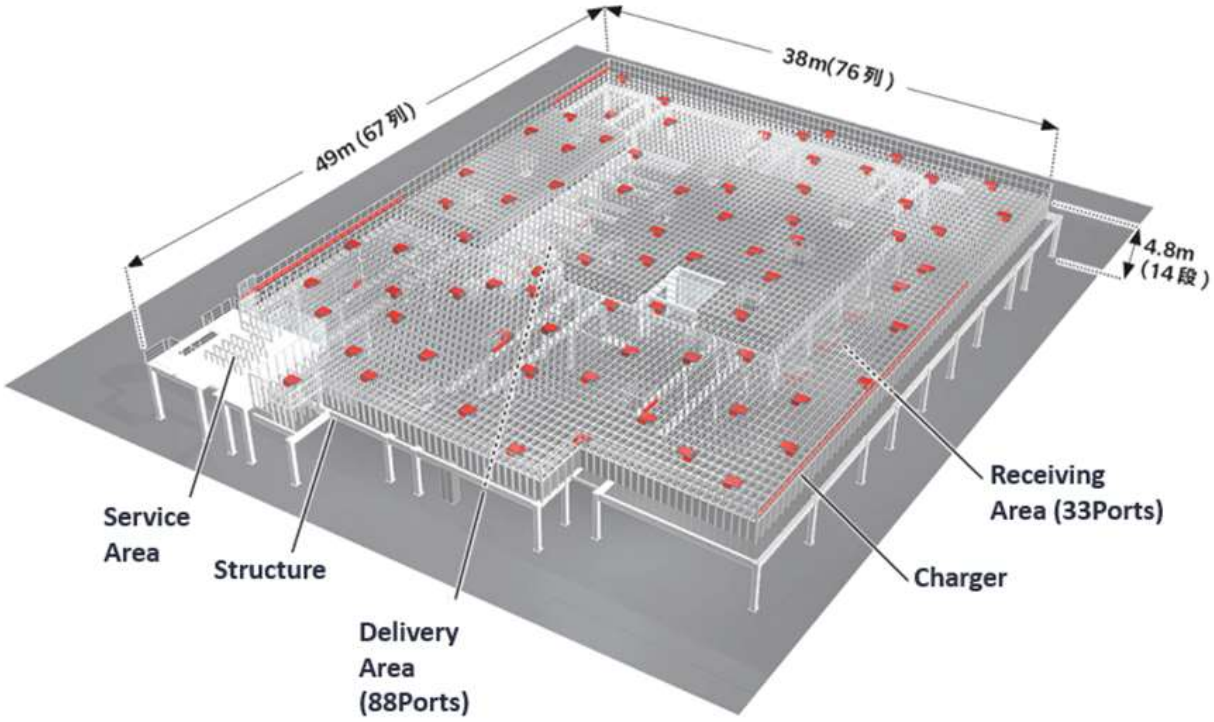
A traditional warehouse setup requires hoisting, conveying, picking, and placing machinery and racks to put away, store, pick, and place items. An AS/RS combines these functions within a single system, allowing warehouse managers to automate their facilities in a much leaner way than with traditional machinery.

C. Adoption success story

In 2019, **Siemens** purchased an AS/RS for its production and distribution warehouse in Chemnitz, Germany. The company says it has realized a 60% decrease in warehouse space required for the same inventory level as before installing the system and has decreased its staffing cost by 40%.

D. Selected market statistic

Autostore, one of the top three AS/RS vendors, grew at a stunning rate of +80% from 2020 to 2021 (from $182M to $327M). The company currently has supply constraints due to high demand.



AutoStore's (AS/RS) system installed for Hayabusa (Japanese producer of fishing rigs), the largest AS/RS installation in Japan (Source)

2. Sourcing software with market intelligence

A. Technology overview

Sourcing & supplier management software helps companies find suppliers to ensure they have the right components available in the right quantity to maintain their activities. The latest innovation in this segment is the addition of market intelligence that allows the procurement team to act more strategically.

B. How it improves supply chains

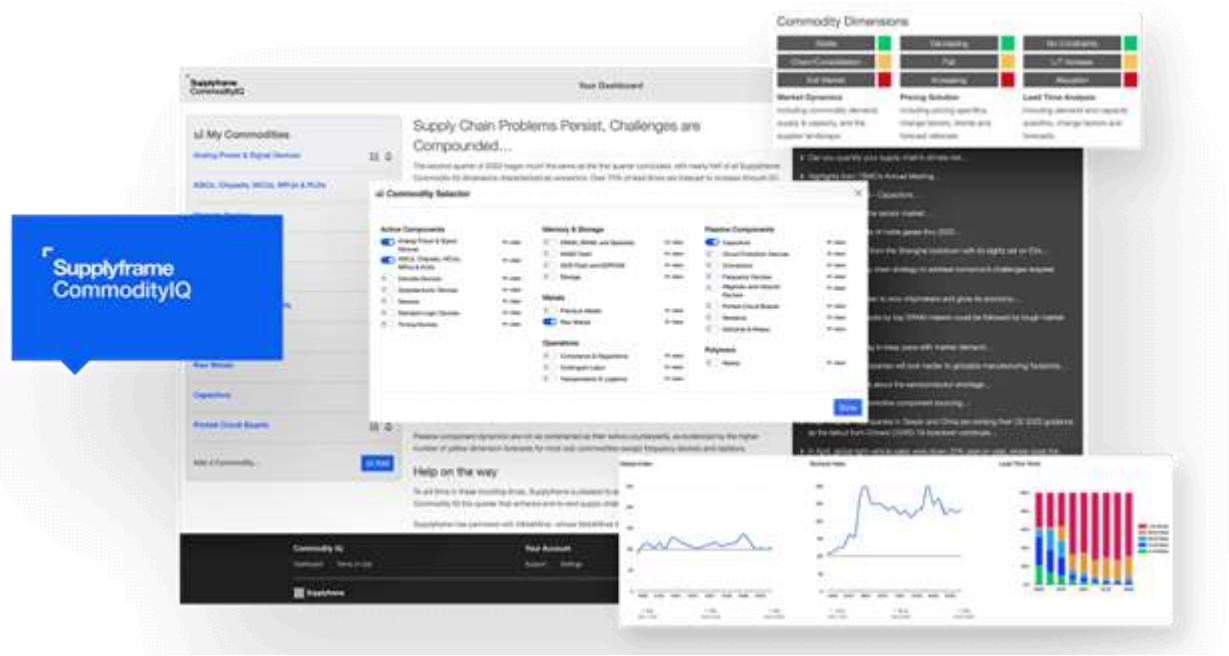
Market intelligence for sourcing helps purchasing managers make better decisions with a frequently updated insight on market dynamics, pricing, lead times, and regional and raw material trends. For example, procurement can now have a live view of the network of potential suppliers based on the current supply capabilities. This information can be used in supplier negotiations or for ensuring companies do not run out of stock of key components.

C. Adoption success story

Molex, a US-based provider of electronic connectors, announced in November 2022 that it will work with **Siemens SupplyFrame CQI** market intelligence software to accelerate their sourcing processes with dynamic bills of materials based on real-time supplier analysis capabilities throughout its entire procurement team.

D. Selected market statistic

IoT Analytics expects sourcing and supplier management software to grow at a +10% CAGR from 2021 to 2027, driven by companies re-assessing their sourcing strategy (mostly towards multi-supplier sourcing) and by new technology innovations, such as market intelligence tools.



SupplyFrame's Commodity IQ sourcing and supplier management software with material and component shortages forecast (Source)

3. IoT track and trace devices

A. Technology overview

IoT-based track and trace devices allow a (near) real-time view on goods in the supply chain (e.g., goods on a pallet or inside a container). The devices are equipped with data collection (sensing) and connectivity modules (often using cellular or satellite technology).

B. How it improves supply chains

By using track and trace, companies get a whole new level of visibility on their supply chain. Not only can companies track the exact whereabouts of their goods in the supply chain, it also allows them to calculate estimated times of arrival and in some cases the physical conditions (e.g., temperature) of the goods. The data from the devices also allows companies to identify weaknesses in the supply networks by analyzing where bottlenecks occur or at what points along the journey cargo is frequently damaged.

C. Adoption success story

In April 2022, shipping company **Hapag Lloyd** announced a new track and trace project for their dry container fleet. The company aims to install tracking devices to connect most of its dry container fleet (approximately 1.6M containers) on a single platform by 2023. Hapag-Lloyd works with two vendors on this project: **Orbcomm** and **Nexxiot**.

D. Selected market statistic

As part of its research, IoT Analytics identified more than 130 vendors offering IoT-based track and trace devices and related software.

First installation of Nexxiot's Globehopper Edge tracking device on a Hapag-Lloyd shipping container (August 2022)

4. Supply chain digital twins

A. Technology overview

A supply chain digital twin is a digital replication/model of the supply chain (with corresponding data synchronization properties). It allows the user to determine the impact of a change in physical reality by first testing the changes in the digital model and then simulating/predicting the outcome accordingly.

B. How it improves supply chains

With supply chain digital twins, companies can optimize their supply chain planning and design. Companies can test the impact of different supply chain scenarios (such as the potential effect of a manufacturing facility closure). They can then see what the potential effect on key supply chain KPIs is (e.g., how lead times and inventory levels will be affected).

C. Adoption success story

The **Renault Group** was one of the first customers of **Google's** supply chain digital twin software and started to adopt the technology in September 2021. Since then, the Renault Group shared that it had managed to replicate 90% of its supply chain flows in a supply chain digital twin.

D. Selected market statistic

In the digital supply chain 2022–2027 market report, the supply chain digital twin subcategory is included as part of the Supply Chain Planning and Design Software category, which grew at a +15% rate in 2022.

5. Intralogistics robots

A. Technology overview

The purchase of intralogistics robotics vendor **Kiva System** by **Amazon Robotics** for $0.7 billion in 2018 enabled Amazon to make next-day and second-day delivery a reality. Competitors were shocked. The likes of **Walmart** only matched Amazon's efficiency level a year later, but only in select countries, and also refused to disclose the cost of the investments it took. Intralogistics robots are machines that are automatically controlled, reprogrammable, multi-purposed (capable of being adapted to a different application with physical alteration), and programmable in three or more axes. They are specifically designed for intralogistics picking and placing because they can operate on limited floor space and reach into shelves, palletizing machines, or conveyors to load and unload parts.

B. How it improves supply chains

Intralogistics robots improve warehouse ai havutomation and efficiency significantly, leading to faster operations and the ability to handle demand peaks much better.

C. Adoption success story

DHL announced in January 2022 that it would invest $15 million to equip its warehouses in North America, including facilities at O'Hare International Airport and the Cincinnati/Northern Kentucky Airport with **Boston Dynamics'** Stretch Robot. DHL mentioned that the robots would play a significant role in improving the efficiency of their warehouses in North America (where labor cost are high).

D. Selected market statistic

According to the **International Federation of Robotics (IFR)**, new smaller intralogistics robots are gaining popularity. 49.5 thousand units were shipped in 2021 (+45% year to year growth vs. 2020).

BostonDynamics' "Stretch": The first robot developed specifically for logistics applications (Source)

6. AI-enabled inventory optimization software

A. Technology overview

Modern inventory planning is a very data-heavy task with companies compiling millions of data points. AI-enabled inventory optimization software is helping companies crunch these numbers much faster than before. It automates, streamlines, and controls the in- and outbound inventory flows and improves the process with AI capabilities.

B. How it improves supply chains

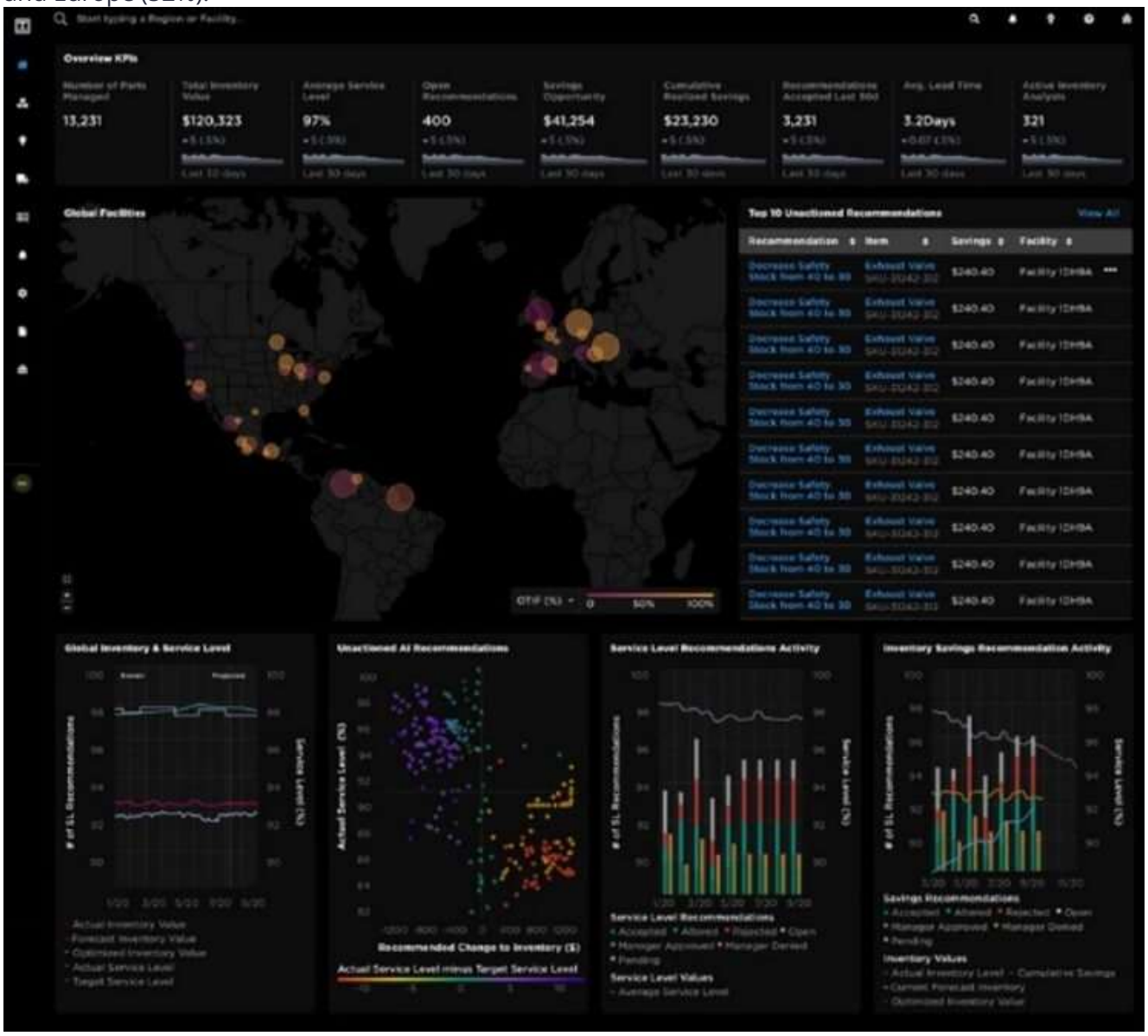
AI-enabled inventory optimization software applies AI to continuously search for strategies to minimize inventory while maintaining confidence that the company will have sufficient inventory available to meet customer's needs. This innovation helps companies to find better ways to assess optimal safety stock levels.

C. Adoption success story

A fortune 500 electronic manufacturer implemented **C3.AI's** inventory optimization software and realized a $42 million working capital reduction by implementing 74% of the software's inventory optimization suggestions, such as gradually minimizing safety stocks on inventory items that aren't used.

D. Selected market statistic

As part of research on industry 4.0, IoT Analytics identified that more than 56% of manufacturers in the APAC region have an AI strategy. The region's manufacturers are ahead of North America (53%) and Europe (52%).



The C3.AI's inventory optimization dashboard shows users' potential inventory savings and costs and highlights the highest savings opportunities (Source)

7. IoT-based proactive field service

A. Technology overview

IoT-based proactive field service software provides a step up from traditional field service of assets running in the field. While traditional field service software mostly works reactively by allocating field service technicians to a site after a failure has been reported, proactive field service uses IoT and predictive maintenance to send field service technicians to a remote site before the asset fails.

B. How it improves supply chains

Proactively performing field service operations on assets ensures that such assets won't fail. Not only does this lead to higher asset uptime, but it also leads to earlier spare part ordering which ensures these orders do not need to be rushed through the supply chain with the highest priority. IoT-based proactive field service maintenance software also ensures that field service workers are as productive as possible while using minimum spare parts.

C. Adoption success story

3D Systems, a US-based additive manufacturing solution company, implemented an IoT-based proactive field service software and reduced its spare parts usage by 62%.

D. Selected Market Statistic

Field service vendor **ServiceMax** (recently acquired by **PTC**) performs annual customer surveys and identified that its customers increased their field service worker productivity by 23% on average when using proactive field service software.

8. Supply chain visibility software

A. Technology overview

Supply chain visibility is key to creating supply chain networks that will survive disruptions like the global COVID-19 pandemic. Companies ask questions such as: "What backup supplier can help us avoid stopping production?" or "When will my shipment finally arrive?" With supply chain visibility software, companies can get a simple, quick overview of all the important supply chain-related metrics that are key to running smooth operations, such as average lead times or inventory levels.

B. How it improves supply chains

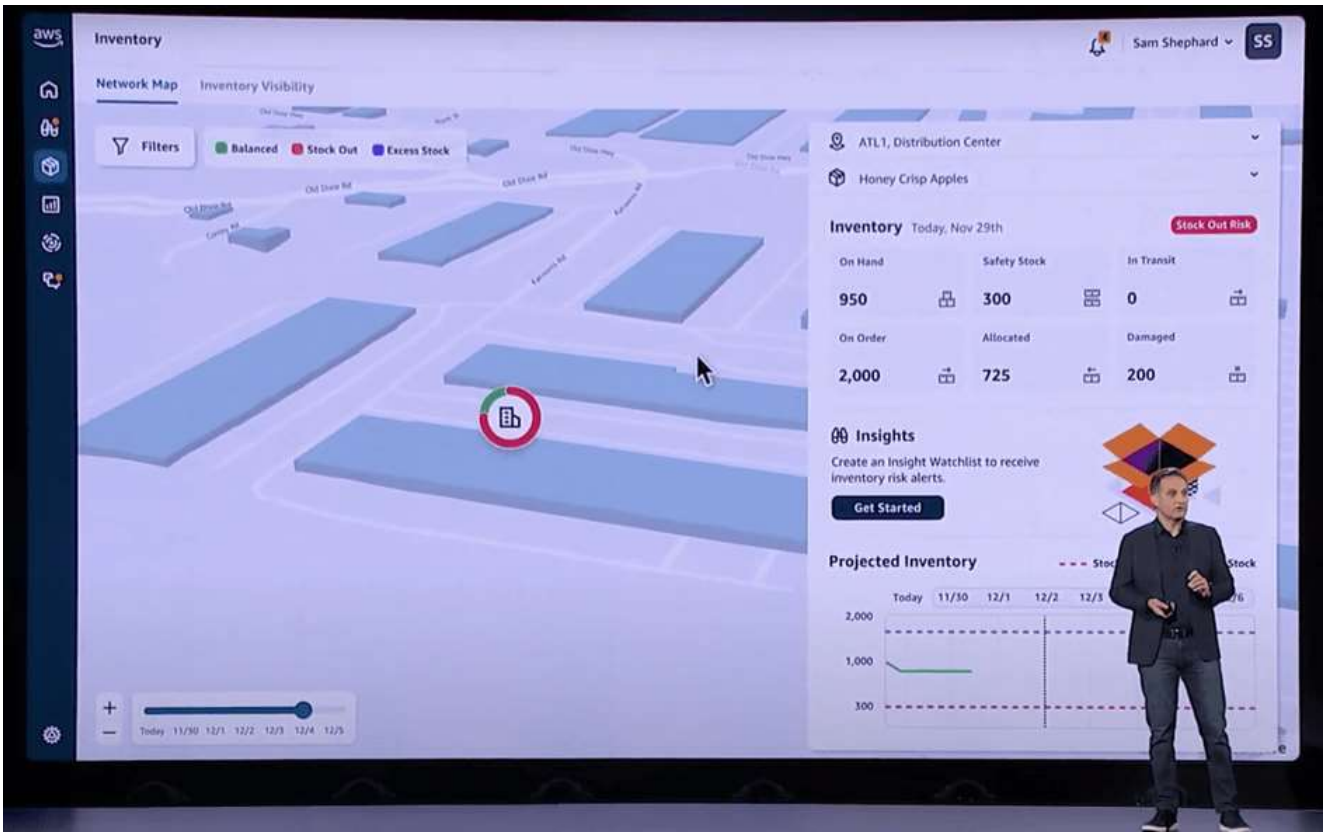
By using supply chain visibility software, companies get a much better handle on where their current goods in transit are and when they are expected to arrive. The tools also provide instant alerts when a crucial shipment is expected to get delayed.
Upcoming supply chain visibility software vendors, like **project44** or **FourKites**, purchase a great amount of data themselves from various stakeholders, such as port operators, to inform their customers.

C. Adoption success story

In 2020, a US-based food and beverage retailer company chose **FourKites**' supply chain visibility software to gain visibility over its shipments' estimated arrival times. According to FourKites, the company managed to attain a 99% accuracy rate on estimated delivery time predictions.

D. Selected market statistic

Supply chain visibility software vendor **project44** claims to have collected 100 billion terabytes worth of supply-chain-related data in the last ten years. This number has been growing from 2 billion in 2010 to 79 billion in 2021.



First introduction of Amazon's supply chain visibility software by AWS' CEO Adam Selipsky (Source)

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