



The future unmasked  
Predicting the future of  
healthcare and life sciences  
in 2025

**Prediction Eight**

**Next generation supply chains are integrated  
into healthcare and the patient experience**

# Foreword

Welcome to our eighth prediction, *Next generation supply chains are integrated into healthcare and the patient experience*, from our report *The future unmasked: Predicting the future of healthcare and life sciences in 2025*. This is the eighth of ten predictions, all of which have been informed by emerging evidence of the impact of the COVID-19 pandemic on society and the health ecosystem. They have also been shaped by our research insights including our global 2040 Future of Health campaign. This eighth prediction considers what the world in 2025 looks like for a more interconnected digitally-enabled biopharma supply chain.

During 2020, the COVID-19 pandemic highlighted the critical importance of an operational global biopharma supply chain, but it also exposed its vulnerability to global shocks. Companies affected the most by the pandemic are those that rely largely on a single geography or a single supplier for key products. Experience with COVID-19 also highlighted the need for many companies to accelerate the digitalisation of their manufacturing and supply chain operations. Today, the biggest challenges facing biopharma are the development, manufacturing and equitable distribution of safe and efficacious COVID-19 vaccines, as well as establishing trust in their manufacture and supply.

In 2025, the adoption of advanced digital technologies has improved the visibility and efficiency of the supply chain. Many companies have shifted from a traditional linear supply chain to an AI-enabled interconnected digital supply network (DSN). This has resulted in more efficient demand forecasting, inventory management, logistics optimisation, procurement, and workforce planning.

Our eighth prediction is brought to life through a series of portraits imagining the experience of individuals in 2025, with reference to the evidence today to predict what the future might look like tomorrow.

Stay tuned for the subsequent predictions in our series.

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# Next generation supply chains are integrated into healthcare and the patient experience

The convergence of clinical, commercial and manufacturing processes, networked through data-driven value chains

**Prediction:** In 2025, the adoption of advanced digital technologies has improved the visibility and efficiency of the supply chain. Many companies have shifted from a linear supply chain to an interconnected digital supply network (DSN), which utilises interoperable data to provide a foundation for companies to compete more effectively. Track and trace is no longer a vision, but a blockchain-enabled reality from manufacturing to the patient and HCP. AI technologies have transformed the supply chain and manufacturing through real-time data processing and decision-making, reducing the risks of human subjectivity and bias. Commercial, regulatory and operational data have been unlocked by AI tools to identify non-linear and complex relationships and provide strategic insights for improving the supply chain. Advanced analytics have helped deliver significant improvements in productivity and costs. This has enabled more efficient demand forecasting, inventory management, logistics optimisation, procurement, and workforce planning. Biopharma companies have streamlined their regulatory compliance functions across the supply chain to overcome functional siloes and improve efficiency across the product lifecycle.

## The world in 2025

- Advanced data analytics have transformed the operating models of the pharma supply chain enabling a fundamental shift from linear to dynamic, interconnected DSNs.
- Control towers provide end-to-end visibility across the supply chain with AI tools applied to real-time data to generate actionable insights and improve decision-making and regulatory compliance.
- Companies have adopted robust Third Party Risk Management (TPRM) solutions to manage global risks.
- Data analytics are used to interpret data from multiple sources to detect patterns and anomalies, including creating a digital twin of the supply chain to produce better demand forecasts.
- Companies have reevaluated their overall value chain, manufacturing and transport to meet the overall companies' sustainability goals. Smart transport vehicles provide real-time insights about delivery and product status.
- Responsible supply chains enabled by advanced automation and open data management have improved transparency while supporting biopharma companies to collaborate more effectively with regulators, improving compliance.
- Companies improve operational effectiveness by adopting a resilience-by-design mind-set (such as financial and reputational resilience) and deploy predictive maintenance, including optimising machine uptime.
- Sensors and actuators within facilities, connected securely to the cloud or data centre, provide companies with BI across the supply chain.

## Conquered constraints

- **Skills and talent:** Collaborations with experts in other industries have improved the skill-set of in-house staff and helped to establish a more diverse workforce, including experts on AI design-thinking. Manufacturing and distribution staff are more flexible, digitally-literate and open to continuous learning.
- **Funding:** The return on investment in DSNs has improved across the supply chain. Earnings before interest, tax, depreciation and amortisation (EBITA) have increased substantially over the past five years. This has convinced companies of the benefits to be gained by investing in advanced technologies, including investing in robotic applications and intelligent real-time monitoring systems to track operational performance.
- **Regulations:** Regulators use accelerators and 'sandboxes' to test products, services and business models. RPA risk management tools ensure regulatory requirements are met. International agreements have reduced the risk of individual governments resorting to trade protectionism. Compliance with the EU's Falsified Medicines Directive and FDA's Drug Supply Chain Security Act (DSCSA) has improved product traceability and visibility. TPRM across the life sciences industry helps clients make a positive ethical impact, reduce regulatory risk and manage supply chains faster and more efficiently.
- **Data and interoperability:** Data integrity has improved by establishing a robust IT infrastructure and adopting FAIR standards, reliable connectivity and robust cloud-enabled data security across the DSN. Blockchain technologies provide transparency in tracking systems (through visibility of the chain of custody and chain of identified risks), especially in multi-nodal hand-offs.

## Imagine the world in 2025

### Real-time, end-to-end tracking to deliver cell and gene therapies

In biopharma's hyper-connected, globally complex supply chain, companies need to respond rapidly to any event that impacts outcomes, which is particularly challenging when distributing therapies derived from living organisms. IPTerapeutics (IPT) is a leading clinical stage biotech company that develops cell and gene therapies. Through a partnership with Olaf Logistics, an AI-enabled cold chain logistics company, IPT can have end-to-end visibility across its supply chain. Olaf Logistics' advanced cold chain technology integrates a real-time tracking software from packaging and storage to transportation and distribution, ensuring the effectiveness and safety of IPT's temperature-sensitive cell and gene therapies when they reach individual patients. This advanced logistics system links patients and clinicians and the manufacturing site with complete visibility to produce therapies for individual patients. Through continuous collection and aggregation of data on temperature, conditions and packaging across all supply chain functions, IPT and Olaf Logistics are able to use AI-based predictive analytics to generate actionable data and take proactive and timely interventions when any issue arises.

### Deploying digital twins to drive efficiencies and reduce costs for manufacturers

'Spear' is an optimisation and simulation engine that helps manufacturers find better ways to balance their production and inventory. In order to understand the best way to meet the demand, Spear analyses entire product portfolios and builds digital twins of production lines. It also optimises costs involved in production and storage to determine the right production frequency and optimal production pattern for each product. It also optimises inventory by defining exactly how much stock should be held in each warehouse. In the final step of the simulation, Spear models millions of possible permutations to validate findings and arrive at a new operational model. LJPharma, a large global pharma company, wanted to make its complex production processes more efficient, and contracted Spear to develop a digital twin across its five main production lines. In under a year, LJPharma realised a reduction in its working capital and additional operational savings. Spear has also shown the potential to cut manufacturers' changeover times by up to 22% and reduce inventories by up to 25%.

### How AI is driving integration of planning and operations across the pharma supply chain

RST Solutions, is a decision management software company that uses an AI platform to power integrated planning and operations across pharma manufacturing companies. RST's platform provides demand forecasting, commercial and supply chain planning, and integrated business planning. It brings together graph modelling, big data analytics and advanced algorithms to provide demand forecasting and scenario planning. It also provides a digital engagement portal and easy-to-use interfaces for customers, suppliers, internal operations, on one cloud-based platform. Jamie is a data analysts who is leading a project with one of RST Solutions' key clients, PharmaKF, and is leveraging the RST platform to integrate PharmaKF's business and operational planning and model the effect of demand and supply challenges across its complex supply chain. The supply modelling identified a number of potential disruptions in the transport infrastructure and ran a number of simulations to identify workarounds. PharmaKF was able to intervene early and address the transportation problem ensuring that its products were delivered in a safe and timely manner.

# Evidence in 2020

## GSK is accelerating technology adoption in manufacturing

GSK is building a 'pharmaceutical factory of the future'. In 2016, the company used knowledge gained by other industries using Industry 4.0 technologies, to develop its own project in Stevenage, UK: the IIM Digitisation Lab. GSK built this unit to be used as a proof-of-concept facility to demonstrate what a 'data-based strategy' for manufacturing within the company might look like. To build the IIM Digitisation Lab, GSK reached out to different partners, including Siemens, which has experience on transformative technological innovations in its own industry. Siemens' role in the partnership was key to integrating data acquisition and use, as well as workflow execution, including the elimination of paper records.<sup>91,92</sup>

## Merck KGaA uses ML to optimise demand forecasting

Merck, headquartered in Darmstadt, Germany, has embarked on a multi-year project to create a data-driven supply chain operation to optimise demand forecasting. It is using a combination of tools (SAP Integrated Business Planning, ML Statistical Forecast and home-made ML engines) to provide an Automated Demand Forecast, helping to increase efficiency across its supply chain. This Automated Demand Forecast is proving to be better than the standard judgmental forecast for 75% of the products for which a statistical forecast can be generated. A better forecast is helping to optimise the Service level production plan, and reduce costs by optimising inventory levels. The Automated Demand Forecast is also reducing the time spent on forecasting, allowing this time to be allocated to more value-added tasks.<sup>93</sup>

## Gartner forecasts that the supply chain and manufacturing solutions market will exceed \$19 billion by the end of 2021

This is driven largely by software as a service (SaaS), which will enable new revenue opportunities (estimated value \$6 billion).<sup>94</sup>

## RxAll and FarmaTrust are using AI-enabled digital solutions to fight fake medicines across the world

RxAll, a US start-up, has developed an AI-based technology to provide patients with access to authentic, high-quality drugs. Its platform combines a proprietary molecular sensor (a spectrometer) and a cloud-based DL algorithm, and uses a database of spectral signatures of drugs, to perform non-destructive verification of drugs authenticity. Its newest device, the RxScanner II, can identify the authenticity and quality of prescription drugs – in tablet, powder or liquid forms – in 20 seconds and with an accuracy of 99.9%. This technology is used by hospitals, pharmacies, biopharma and regulatory bodies around the world. Their ML system continuously learns from the spectral reads to inform pharmaceutical manufacturers about counterfeiting.<sup>95</sup>

FarmaTrust is a company that offers digital solutions that combine blockchain and AI tools to create a system that is immutable, secure and transparent, supporting data-driven decisions. The company's solution provides end-to-end traceability of biopharma products to safeguard the supply chain against counterfeit or substandard medicines. In addition, clients can use FarmaTrust's Consumer Confidence App for authentication of medicinal products.<sup>96</sup>

## BlueDot Insights – infectious disease tracking

BlueDot Insights sends tailored, near real-time smart-alerts about infectious diseases with global visibility. The alerts can be used by biopharma companies to adjust their operations accordingly, and is vital for biopharma companies to optimise the manufacturing and distribution of specific drugs to affected areas.<sup>97</sup>

## Maintaining temperature stability of biologics is a key supply chain requirement

Biologics are difficult to keep stable with temperature fluctuations and contamination affecting batch quality and yield, especially during transportation. Given that regulations require end-to-end, rigorous temperature control, cold-chain transportation technology needs to be integrated with tracking software to ensure the effectiveness and safety of therapeutics when they reach patients. By 2022, an estimated 30 of the 50 top global biopharma products will require cold chain handling and specialised, temperature-controlled logistics. Advanced, intelligent technologies that allow for real-time end-to-end visibility can enable biopharma and logistics companies to track the state of the drugs and take proactive and timely interventions when any issue arises. For example, companies like Vineti Inc and Cryoport Inc integrate IT systems, track shipments and maintain chain of custody and temperature logs in gene therapy patient cycles.<sup>98</sup>

## The COVID-19 impact

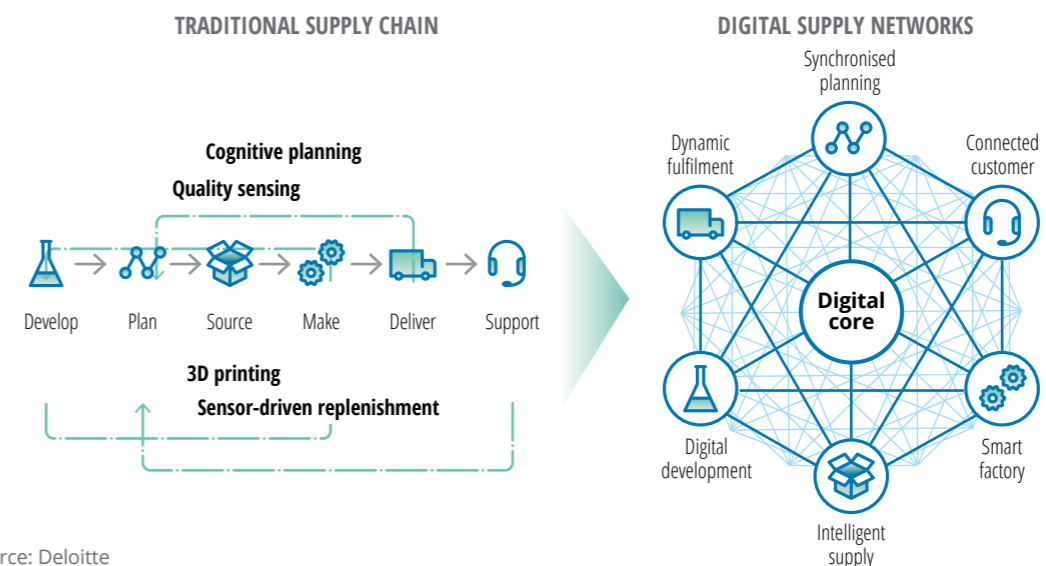
### Deloitte view on the impact of COVID-19

The COVID-19 pandemic has highlighted the critical importance of an operational global biopharma supply chain, but has also exposed its vulnerability to global shocks. Companies affected most are those that rely largely on a single geography or a single supplier for key products. From the outset, countries across the world have used export bans, price caps and supply chain diversions to shore up supplies for COVID-19 patients within their own populations. Consequently, many biopharma companies are considering the location of their manufacturing facilities. Experience with COVID-19 highlights the need for companies to accelerate the digitalisation of their manufacturing and supply chain operations. Companies and governments are actively reevaluating the resilience and integrity of their sourcing strategies and considering diversifying through 'Near Sourcing', 'Localisation', and 'Moving closer to the customer'. A major challenge now is the development, manufacturing and equitable distribution of safe and effective vaccines; requiring the world's largest ever supply chain infrastructure. Manufacturers have taken a risk by standing up facilities and preparing a resilient and scalable supply chain in anticipation of regulatory approval. Functionalities such as identification of recipients (vaccine passports) and cold-chain transportation technology integrated with real-time, end-to-end tracking software, will be important in ensuring safe, equitable and efficient distribution. Governments, regulators and pharma companies will have to work together to establish trust in the vaccines.

### Moderna Therapeutics has digitalisation as a core element of their business strategy

Moderna is a clinical stage biotechnology company pioneering the development of messenger RNA (mRNA) therapeutics and vaccines that have a therapeutic or preventive effect on a broad spectrum of diseases. Moderna is also a front-runner in the development of a COVID-19 vaccine. Its digitalisation strategy has six key building blocks: AI – analytics and predictive modelling; Cloud – to provide computational power, agility, cost-effectiveness and processing of data; Integration – to bring data and processes together; IoMT – based on smart, interconnected devices to improve compliance and traceability in the supply chain, control inventory, and optimise energy consumption; Automation and robotics – to increase operational accuracy, repeatability and throughput, while reducing human errors and improving quality and compliance; Analytics – to generate insights for informed decision-making. The Moderna Technology Center (MTC) manufacturing facility, designed to Current Good Manufacturing Practices specifications, has three core functions: Pre-clinical production – to develop materials for pre-toxicology studies using integrated robotics; Clinical production – to run Phase I and II clinical development programmes driven by real-time data and a fully integrated manufacturing execution system; and a Personalised cancer vaccine (PCV) unit – to ensure fast manufacturing and supply of individualised batches.<sup>99,100</sup>

## The evolution towards the Digital Supply Network: from linear to network thinking



A DSN integrates data and information from different sources by leveraging advanced digital technologies, and enables greater product visibility, traceability and inventory control.

Source: Deloitte

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# Endnotes

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