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## Creating Life Sciences Supply Chain Resilience Through Data and Analytics

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## THE VITAL ROLE OF SUPPLY CHAINS IN LIFE SCIENCES

The life sciences supply chain has faced a range of challenges over the past few years, including shortages of critical medications and medical supplies, disruptions caused by natural disasters, geopolitical factors, and unexpected spikes in demand. This, of course, has been exacerbated by the pandemic. Supply chain resiliency is critically important in life sciences. Components flowing through the supply chain are needed for medical devices, drugs, and other lifesaving items. For instance, sensors are required for medical devices; certain ingredients are needed for active pharmaceutical ingredients (APIs). These essentials can all be impacted by supply chain disruptions.

The parties involved in the supply chain—including manufacturers, contract demand manufacturing organizations (CDMOs), distributors, providers, and others—need visibility to ensure they get the ingredients, parts, and components they need on time. It has also become evident to many life sciences organizations that better insights and analytics are necessary across the entire supply chain, from planning and sourcing to production and delivery. However, according to recent industry research, pharmaceutical executives say supply chain risk is a significant reason for their companies' susceptibility to disruption.<sup>1</sup>

To address these concerns, some life sciences organizations are seeking innovative analytical methods to gain a more comprehensive understanding of their supply chains as well as implementing a robust data infrastructure to enhance their operations. For instance, some organizations are performing transportation forecasting to determine when a part will get

from point A to point B. Others are performing dynamic risk management for order vulnerabilities or collaborative scheduling with other supply chain members. This will involve sharing data and analytics across the supply chain.

The life sciences industry still has a journey ahead of itself. According to TDWI research, the pharmaceutical industry, as is the case with other industries, doesn't have an extensive data sharing model. Typically, sharing is done via spreadsheets. Additionally, the pharmaceuticals industry is not necessarily making use of new data types, such as sensor data for tracking and tracing. It is only now starting to move to a scalable architecture where data and analytics can be operationalized.

How does the life sciences industry utilize data and analytics to improve the resiliency of its supply chain? This TDWI Insight Accelerator discusses key challenges and recommendations for overcoming them, including how cloud solutions can help.

## OPERATIONAL PAIN POINTS FOR SUPPLY CHAIN ANALYTICS

A resilient supply chain is often a connected supply chain, i.e., one where participants are connected to share data and analysis. However, life sciences organizations often face challenges in this regard. These include:

- **Limited visibility across the supply chain.** The life sciences supply chain is made up of many partners, including life science companies (such as biotech firms), CDMOs that may manufacture complex therapies and products, API manufacturers, and packagers and distributors, as well as providers and even patients. Together, this forms a global network

<sup>1</sup> See the 2020 report from the McKinsey Global Institute, "Risk, resilience, and rebalancing in global value chains" at <https://www.mckinsey.com/capabilities/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains>.



of partners. To manage this network effectively, end-to-end transparency is needed. For example, manufacturers need to know when they will receive certain components for their production processes. They should also know current inventory levels with distributors and providers, such as pharmacies and hospitals, so they can plan accordingly. They need visibility. Yet, most supply chain participants only have a view of their part of the process. They are not connected; or they may only work with some partners. They lack visibility across the chain and visibility in real time. This makes planning and execution difficult.

- **Difficult collaboration across the supply chain.** Collaboration between supply chain participants is important to ensure that all participants have access to the right information at the right time. This can include sharing inventory level data, demand forecasts, shipping schedules, and more. As we mentioned, currently this data is typically shared via spreadsheets or perhaps methods such as electronic data interchange (EDI). Life sciences companies, historically conservative, have been slow to adopt collaborative data sharing. This is not sustainable because supply chains are becoming more complex and supply chain members need to have solid information for planning and decision-making. Without it, patients may not get the products they need.
- **Lack of the right data for supply chain analytics.** In addition to obtaining useful data for supply chain analysis, organizations often need access to *appropriate* data. For instance, a distributor may need access to weather data to determine whether a shipment will be slowed. API manufacturers need to know if commodity

materials are available. To improve yield, companies may need data from key suppliers. This data is often real time and can help to enrich an existing data set for analysis. However, using this data can be difficult if it is hard to access; analytics can be ineffective at driving efficiencies if there is no data sharing.

- **Challenges meeting compliance and governance objectives.** TDWI research indicates that data governance is a top priority for organizations. Yet, we often see that governance is a challenge, especially as the environment becomes more complex. With multiple data types (perhaps coming from multiple sources on different platforms), it can be hard to ensure high quality and trust in data. Compliance is also a challenge, especially in industries that are highly regulated, such as life sciences. Still, supply chain participants need access to governed data. For example, PII data must meet HIPAA privacy requirements for de-identification. Tracking and tracing are important in life sciences especially with the proliferation of counterfeit drugs and devices. If supply chain participants aren't connected, this becomes almost impossible.

## RECOMMENDATIONS

Creating resilience in the supply chain will require connecting supply chain participants, sharing data, and building more insightful analytics. TDWI recommends these best practices:

- **Understand your business and analytics objectives.** To create resilience in the supply chain, understand your supply chain(s) and what you're trying to achieve. This means answering questions such as: What companies are part of the supply chain that should be



connected? What data do we need to develop a more resilient supply chain? What insights are required? How can these insights be shared? Once you understand where you're trying to go, it is easier to develop a strategy around the connections, data, and analytics you will need.

- **Have an integration plan in place.** To benefit from a resilient supply chain, your organization will need integrated data as part of its plan. This will involve the ability to integrate internal and external data sources for your own analysis, ideally on a unified platform. It will require enriching this data with external data sources for more insights. For instance, you may need external data such as commodity availability and pricing, weather data, or supplier risk data to be able to determine what is happening in your supply chain.
- **Consider data marketplaces.** More often companies are looking to purchase the kind of data mentioned above from third-party providers; often from a data marketplace. A data marketplace enables the buying and selling of data. By design, a marketplace defines a common data model and interface for buyers and sellers to exchange data. Marketplaces are offered by some cloud providers. It will be important to have trusted and high-quality data in the marketplace; in some marketplaces, users can rate the data to give others a sense of this. The data will also need to be fresh, so it needs to be updated frequently. Of course, there needs to be a secure data exchange in place, which means that encryption or other security measures should be enabled if needed for certain data. Make sure to ask questions of your marketplace provider about the features they offer.
- **Ensure that the platform you select can support supply chain analytics.** As your organization faces more complex data and analytics ecosystems, you may consider moving to one or more cloud data platforms. The traditional on-premises data warehouse was not meant for large-scale iterative analytics such as that required to train models. Many data sets need to be brought together for supply chain analytics because data science often demands diverse data for model training. Consider a platform that will support more advanced analytics and different data types (e.g., structured, unstructured, real-time). The platform must be scalable and able to handle workloads such as tracking and tracing that may involve large amounts of real-time data from IoT devices (e.g., tracking temperature of a freight train car transporting product). The platform you select should be able to handle compute-intensive machine learning workloads, such as predictive maintenance for the manufacturing piece of the supply chain. Here, a partner might collect massive amounts of data about their operations. A machine learning model may be able to predict when maintenance is needed and determine how that would impact the supply chain.
- **Consider a platform that enables collaboration and data sharing.** Some cloud platforms enable direct sharing of internal data across cloud environments. This may be done in a data exchange/marketplace-type model (a controlled environment where you can publish data sets into it and consume what is in it) or some other form of private data sharing without having to FTP the files. For example, some platforms will support manufacturers using direct-sharing capabilities to integrate



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quality data from suppliers. This may start with one partner (such as the CDMO) and move to others in the network. Of course, the platform also needs to be secure and able to meet compliance mandates. Ideally the platform also includes some way of building transparency across the supply chain so members can see how one part of the supply chain is impacting other parts.

- **Develop a data governance strategy.** Supply chain data must be accurate to share across the network and use in analytics. Data quality must be consistent. The data must be auditable. As part of the plan, develop a data governance strategy that outlines how you will manage, share, and use your data across the supply chain. This may include establishing data ownership and accountability, ensuring standard data formats and standard rules for data access, addressing how changing data is handled, and, of course, security and privacy policies.
- **Build skills.** To maximize supply chain analytics use, your organization must build data literacy. Individuals across your organization need to be able to understand data, derive insights from it, and communicate results effectively. For example, some business users may be given tools and will need to understand how to use them to generate and interpret results to make business decisions. Business analysts may want to start to build out more sophisticated forecasting models and will need to be trained to do so—to what extent will vary by role, but data literacy has become a critical skill for organizations to succeed.

In summary, your organization will need to deploy the right platform (which will most likely be a cloud platform), connect to partners, share analytics insights, and allow for informed decisions. The platform will need to be scalable and reliable. It will need to provide transparency and visibility. Your organization should also make sure to govern the supply chain network that you put in place and ensure it is secure. With this kind of solution in place, all partners across the global network that is the supply chain can derive value.



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## ABOUT THE AUTHOR



**Fern Halper, Ph.D.**, is vice president and senior director of TDWI Research for advanced analytics. She is well known in the analytics community, having been published hundreds of times on data mining and information technology over the past 20 years. Halper is also coauthor of several Dummies books on cloud computing and big data. She focuses on advanced analytics, including predictive analytics, machine learning, AI, cognitive computing, and big data analytics approaches. She has been a partner at industry analyst firm Hurwitz & Associates and a lead data analyst for Bell Labs. She has taught at both Colgate University and Bentley University. Her Ph.D. is from Texas A&M University.

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