

# Biotech Needs to Transform Their Supply Chain Operating Model

## A Roadmap for Biotech Companies

White Paper

# Last Years Have Sharpened Requirements for Biotech Supply Chains



## Introduction

In an era defined by rapid technological advancements and shifting global market dynamics, the biotech industry faces unprecedented challenges that demand a **revolutionary approach to supply chain management**. The resilience and efficiency of biotech supply chains have been tested by a confluence of factors, including heightened operational cost sensitivity, persistent supply chain disruptions, and an expanding complexity within the industry's global reach. These challenges underscore the urgent need for biotech companies to transform their supply chain operating models to not only navigate the current landscape but also to thrive in the face of future uncertainties.

Operational cost sensitivity, exacerbated by fluctuating interest rates and the intensive capital requirements of clinical trials, has compelled biotech firms to scrutinize their value chains more closely than ever before. **The traditionally available financial leeway, facilitated by low-interest rates, has narrowed, placing a premium on operational efficiencies and innovative cost management strategies.** In parallel, the biotech sector has grappled with ongoing supply chain disruptions that extend far beyond the inconveniences faced by other industries. For biotech, these disruptions are not mere logistical hurdles but existential threats that can delay critical treatments to patients, underscoring the need for supply chains that are not only efficient but also exceptionally resilient.

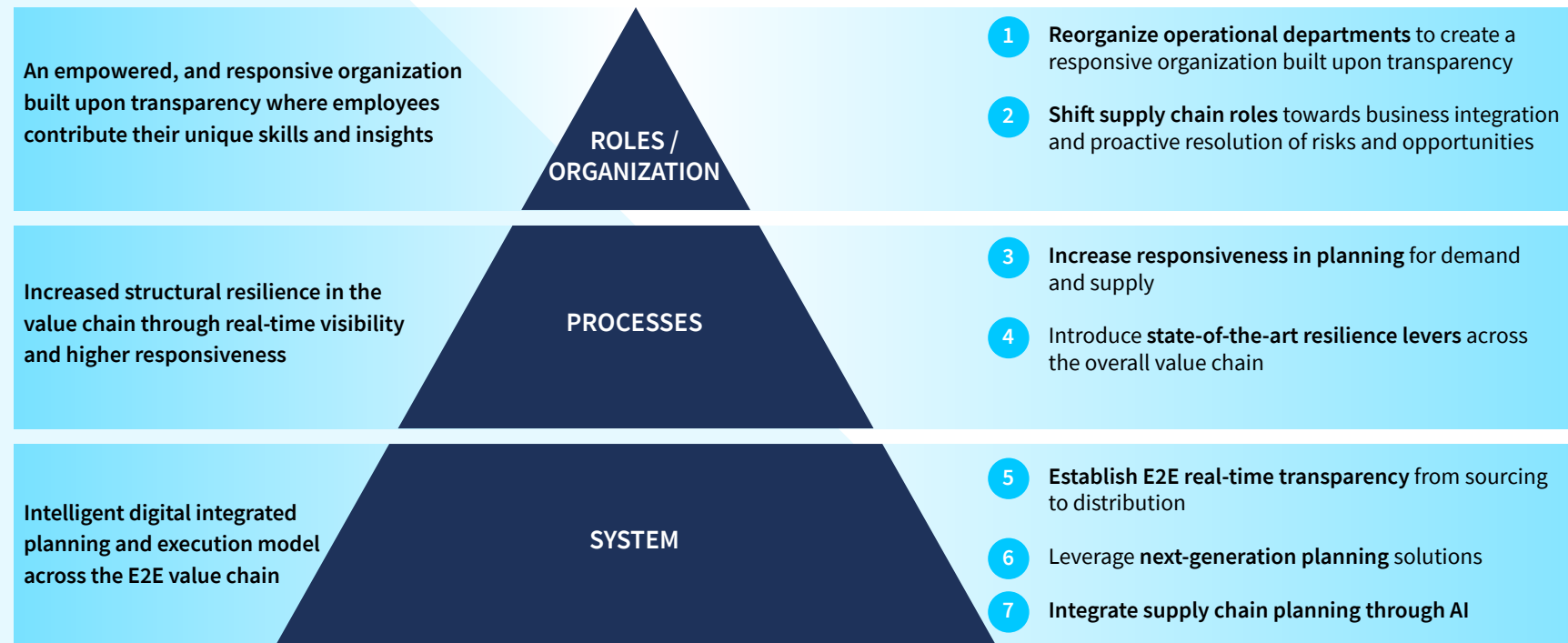
Adding to these challenges is the increasing complexity and reach of biotech supply chains, which is primarily influenced by the trend towards outsourcing and the reshoring policies of governments worldwide. The anticipated growth of the Contract Manufacturing Organization (CMO) and Contract Development and Manufacturing Organization (CDMO) market, projected to exceed 100 billion USD by 2030, **signifies a shift towards more collaborative and integrated supply chain models.** However, this shift also introduces new complexities, from navigating international regulations to managing the logistics of an increasingly fragmented supply network.

This confluence of challenges presents a critical juncture for the biotech industry. It calls for a new operating model that embraces an empowered and responsive organization built upon transparency and the unique skills and insights of its employees. Such a model would not only increase structural resilience in the supply chain through real-time visibility and higher responsiveness but also leverage intelligent, digitally integrated planning and execution across the end-to-end value chain. **In this paper, we will propose a transformative framework for biotech supply chains, aiming to enhance their agility, resilience, and efficiency in an ever-evolving global landscape.**

**A new operating model is needed to cover the advanced requirements**

**REQUIREMENTS**

**ADAPPTIONS NEEDED**



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## ROLES / ORGANIZATION

# Reorganize Operational Departments to Create a Responsive Organization Built upon Transparency



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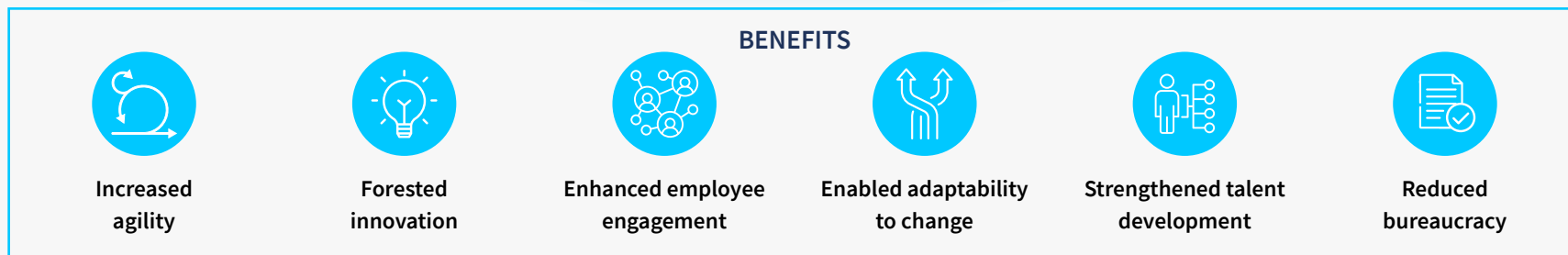
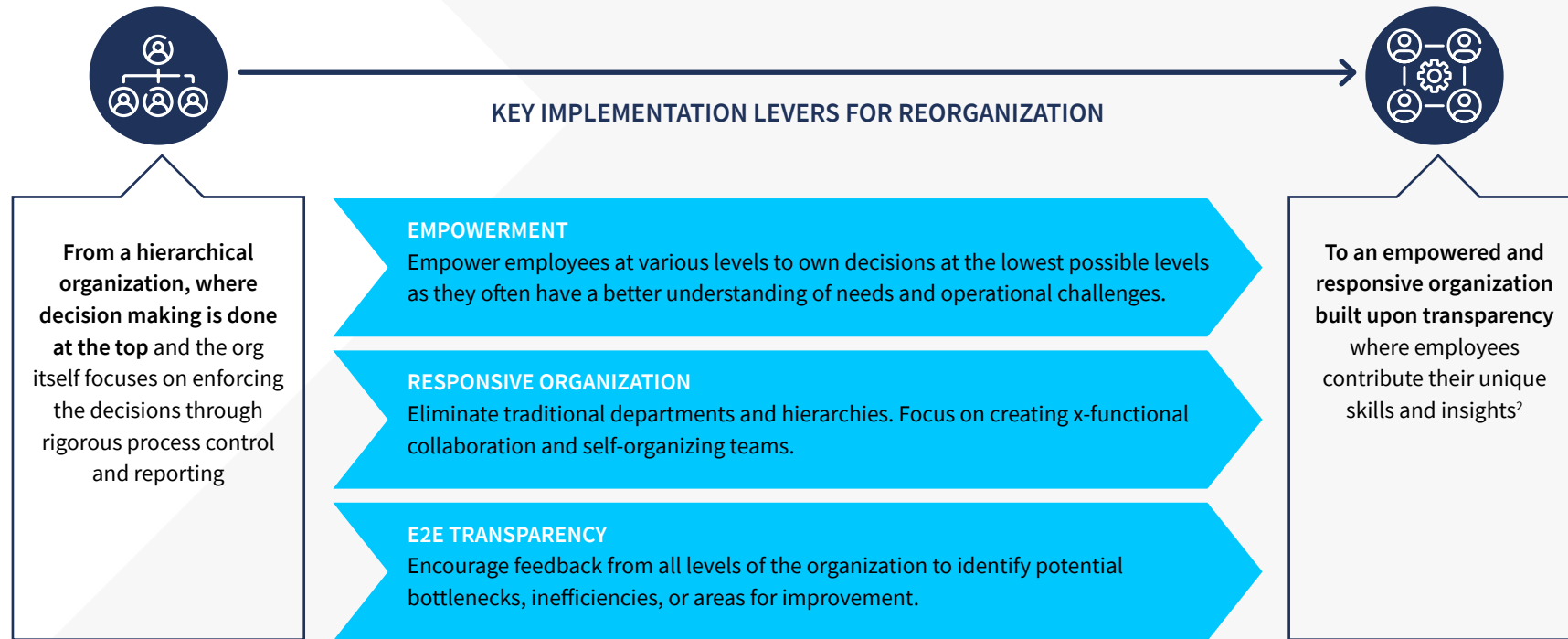
The biotech industry, characterized by its rapid pace of innovation and stringent regulatory requirements, demands an operating model that is not only efficient but also adaptable to the ever-changing landscape. Traditional hierarchical organizational structures, with their slow decision-making processes and siloed departments, are ill-suited to meet these demands. **A paradigm shift towards a more empowered and responsive organization is imperative for the future success of biotech supply chains.** This shift requires a fundamental reorganization of operational departments, aiming to foster transparency, agility, and cross-functional collaboration.<sup>1</sup>

Reorganizing operational departments involves **moving away from a top-down approach**, where decisions are made at the highest levels and enforced through rigorous process control and reporting. Instead, the focus shifts to empowering employees at various levels, enabling them to make decisions based on their understanding of operational challenges and needs. This empowerment is crucial in an industry where the rapid identification and resolution of issues can mean the difference between life and death for patients awaiting critical treatments.

The transformation to a responsive organization necessitates the **elimination of traditional departments and hierarchies, replacing them with cross-functional teams** that collaborate to solve problems and innovate. These teams are equipped with the autonomy to make decisions and act quickly—a stark contrast to the bureaucratic processes that often slow down traditional organizations. By encouraging feedback from all organizational levels, potential bottlenecks, inefficiencies, and areas for improvement can be identified and addressed more swiftly.

There are several benefits of such a reorganization. Increased agility allows the company to **respond more rapidly to market changes, regulatory updates, and supply chain disruptions.** Enhanced employee engagement, resulting from a sense of ownership and contribution to the company's success, leads to improved job satisfaction and talent retention. Moreover, this organizational empowerment fosters a culture of innovation, where employees are encouraged to propose and implement new ideas, driving continuous improvement across the supply chain.

<sup>1</sup> See Gary Hamel, *Humanocracy: Creating Organizations as Amazing as the People Inside Them* (2020)



<sup>2</sup> See Gary Hamel, Humanocracy: Creating Organizations as Amazing as the People Inside Them (2020)

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ROLES / ORGANIZATION

## Shift Supply Chain Roles towards Business Integration and Proactive Resolution of Risks and Opportunities

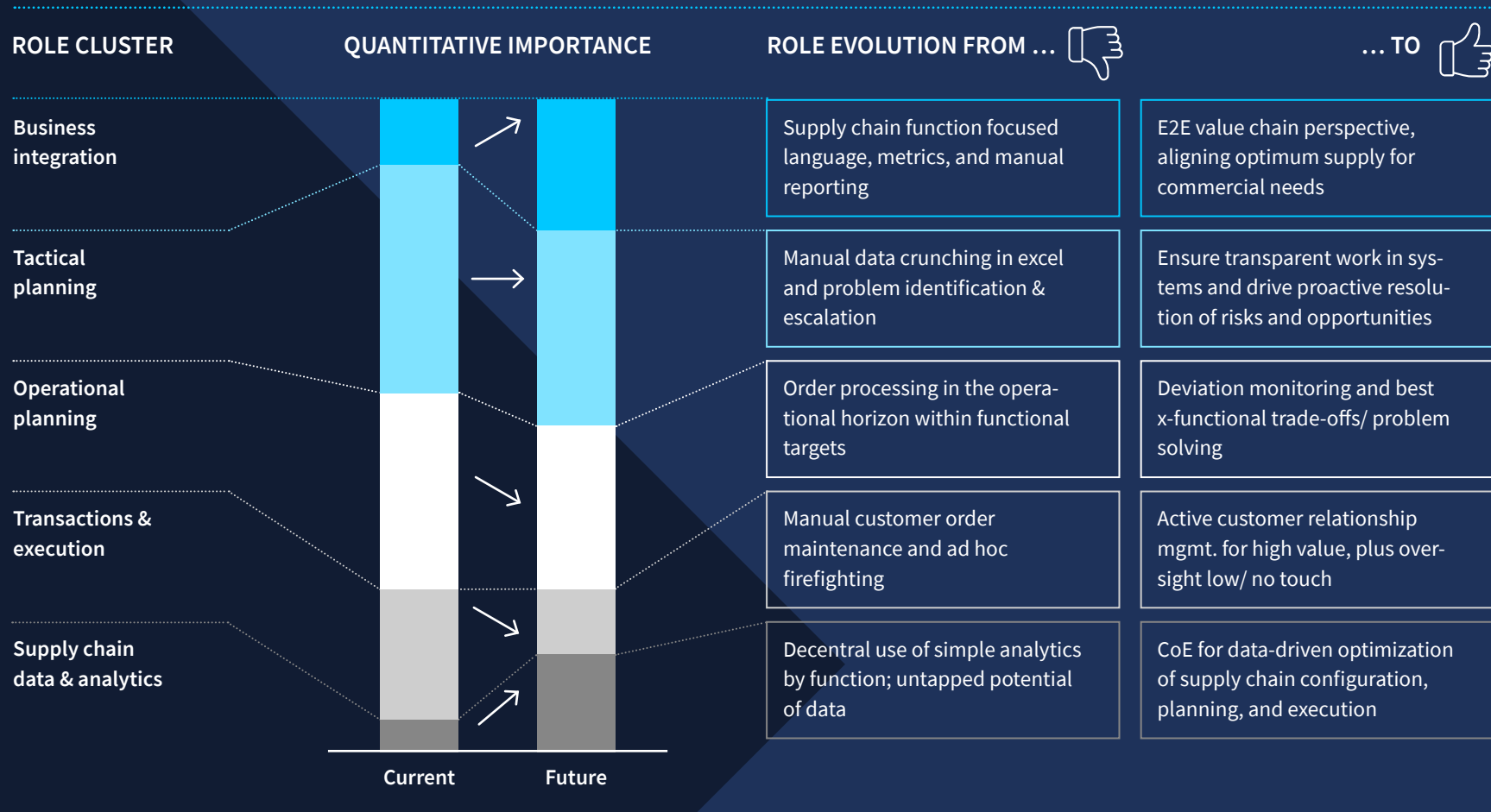
To increase employee contribution with unique skills and insights, biotech companies are recognizing the imperative to evolve their supply chain roles. There is a marked transition from isolated, function-focused roles towards a holistic, business-integrated approach. This evolution is not merely a change in job descriptions but a fundamental shift in how supply chain operations are perceived, executed, and valued within the biotech industry.

The transformation of supply chain roles involves **redefining responsibilities to emphasize end-to-end (E2E) value chain perspectives**. This means moving away from a narrow focus on specific supply chain functions, such as procurement or logistics, and instead aligning roles with the broader business objectives of ensuring product availability, quality, and cost-effectiveness. Supply chain professionals are now expected to possess a **deep understanding of the commercial needs of the business**, enabling them to make decisions that balance supply and demand in a way that supports overall business goals.

A critical aspect of this shift is the proactive resolution of risks and opportunities. In the volatile environment in which biotech companies operate, the ability to anticipate and mitigate risks before they impact the supply chain is invaluable. This requires a blend of strategic foresight, operational flexibility, and the use of advanced analytics and automation tools. By **leveraging data analytics, biotech companies can gain insights into potential supply chain vulnerabilities**, such as supplier reliability issues or changes in market demand, allowing for timely adjustments to supply chain strategies.



Moreover, the integration of automation and data analytics into supply chain roles facilitates a more dynamic and responsive supply chain management approach. Automation tools can handle routine tasks, freeing up supply chain professionals to focus on strategic decision-making and innovation. Similarly, advanced analytics provide a rich data foundation for identifying trends, predicting outcomes, and optimizing supply chain operations, from production scheduling to distribution logistics.





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## PROCESSES

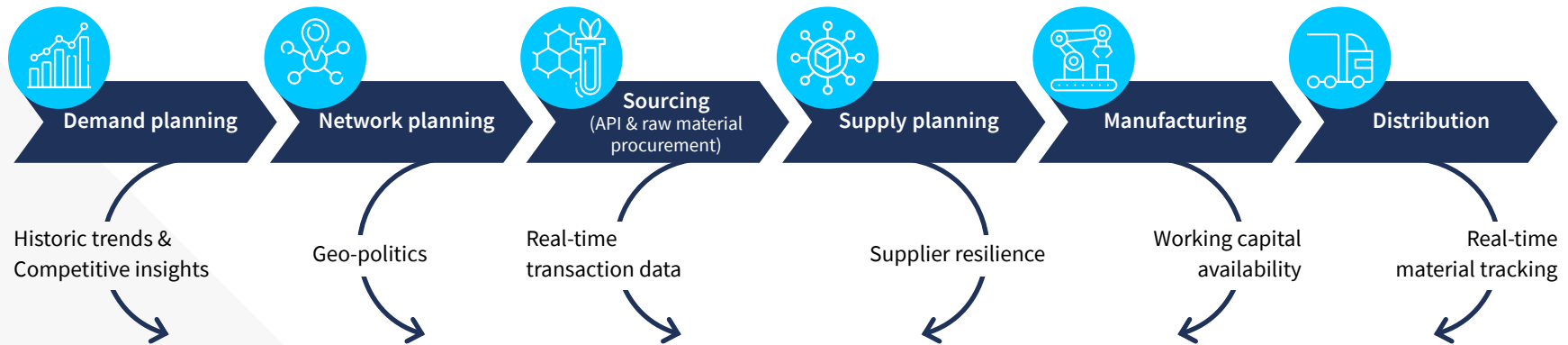
# Increase Responsiveness in Planning for Demand and Supply with a Control Tower

The implementation of an **ad-hoc control tower** for enhanced planning and execution across demand and supply is a strategic innovation aimed at **bolstering visibility and responsiveness**. This concept represents a leap forward in how biotech companies can manage their supply chains, moving away from reactive postures to proactive, data-driven decision-making.

The ad-hoc control tower is not just a physical entity or technological tool, but a **strategic approach that centralizes key planning and execution decision-making**. By bringing together senior cross-functional groups that meet by exception, it leverages digital supply chain capabilities and real-time data to make informed decisions swiftly. This approach is instrumental in reducing latency in information flow and enhancing the supply chain's ability to **respond to sudden changes in demand, supply disruptions, or other unforeseen challenges**.

At the heart of the ad-hoc control tower's effectiveness is its reliance on real-time transaction data, which encompasses various aspects of the supply chain from demand planning to distribution. This data, enabled through digital supply chain technologies, allows for a concurrent planning system. Such a system is equipped to handle real-time inputs and automated re-planning functionalities, thus ensuring that the supply chain can adapt quickly to changing circumstances without significant delays.

The benefits of implementing an ad-hoc control tower extend beyond improved responsiveness. It aids in the **reduction of noise during data analysis, allowing for a clearer understanding of the supply chain's current state and future needs**. This clarity is achieved by integrating cloud computing and advanced data analytics, which provide the ability to analyze datasets in a singular, cohesive system. Moreover, AI-enabled assistance and recommendations further expedite decision-making processes, ensuring that supply chain operations are not only responsive but also optimally aligned with the company's strategic goals.



**CONTROL PLANNING TOWER**

- ▶ **Centralization** of key planning and execution decision-making
- ▶ **Senior x-functional group working by exception**
- ▶ **Enabled through digital supply chain** and real-time data availability
- ▶ **Concurrent Planning system** needed which allows the handling of real-time inputs and automated re-planning functionalities

**BENEFITS**



Reduction of latency while gathering new data thanks to cloud computing and integrated systems



Noise reduction during data analysis with the ability to slice and dice all datasets at once in a singular system



Faster decision-making also with AI-enabled assistance and recommendations

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PROCESSES

# Introduce State-of-the-Art Resilience Levers across the Overall Value Chain



The introduction of state-of-the-art resilience levers across all steps of the value chain emerges as a second step after increasing overall demand and supply responsiveness to meet the unpredictable challenges of the industry.

Resilience in the biotech supply chain transcends the traditional reliance on inventory buffers and redundancy. While these methods have provided a measure of security in the past, the increasing complexity of global supply networks and the unpredictability of demand signals necessitate a more nuanced approach. This paper highlights several exemplary resilience levers, each tailored to address specific vulnerabilities within the supply chain—from demand planning and network planning to sourcing, supply planning, manufacturing, and distribution.

One of the foundational levers is the **utilization of scenario forecasting in demand planning**. This approach enables companies to better prepare for uncertain demand signals by considering a range of potential future states and developing strategies to navigate each scenario effectively. Similarly, **constant monitoring of network health** allows for the early identification of bottlenecks and areas for improvement, ensuring that the supply chain can adapt and reconfigure as needed to maintain operational continuity.

In sourcing and supply planning, ensuring the **multi-sourcing of key materials** is identified as a critical resilience lever. By diversifying their supplier base, companies can reduce the risk of disruptions caused by geopolitical tensions, natural disasters, or other unforeseen events. Additionally, incorporating safety time and safety quantities into planning processes helps ensure on-time production, further bolstering the supply chain's resilience.

In addition, **cross-training the workforce in manufacturing and enabling real-time tracking** with the use of Internet of Things (IoT) technology in distribution is of great importance. These measures not only enhance operational flexibility and efficiency but also provide valuable data that can be used to anticipate and mitigate potential disruptions.

Implementing these state-of-the-art resilience levers requires a strategic, integrated approach that spans the entire value chain. It involves a shift from a reactive, buffer-dependent model to a proactive, data-driven strategy that leverages technology and innovation to build a supply chain capable of withstanding the uncertainties of the global market.

### Exemplary resilience levers across value chain



**Demand planning**  
Use scenario forecasting to better prepare to uncertain demand signals e.g.: delayed reimbursement

**Network planning**  
Constantly monitor networks health to define key bottlenecks and areas for improvement

**Sourcing**  
(API & raw material procurement)  
Ensure multi-sourcing of key materials

**Supply planning**  
Add safety time and safety quantity to ensure production on time

**Manufacturing**  
Cross-train the workforce to increase flexibility in scheduling and production planning

**Distribution**  
Enable real-time tracking with the use of IoT

#### IMPACT ON RESILIENCE



#### COST OF IMPLEMENTATION



#### EXPLANATION

So far, the supply chain in pharma has heavily focused on buffers as a means to reduce risk in the supply chain.

As uncertainties occur today in areas which were regarded as stable before e.g. packaging procurement or shipping lead times inventory buffers are not sufficient anymore.

These additional levers will help to increase overall supply chain resilience while at the same time do not drive cost levels tremendously.

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SYSTEM

## Establish E2E Real-Time Transparency from Sourcing to Distribution



To support the aforementioned levers, technological advancements have to be implemented. The first step is the establishment of E2E real-time transparency through the use of **digital twins**—virtual replicas of physical systems. This innovative approach represents a significant leap forward in how biotech companies can **monitor, manage, and optimize their supply chains in real time**, ensuring agility, efficiency, and resilience in the face of global disruptions.

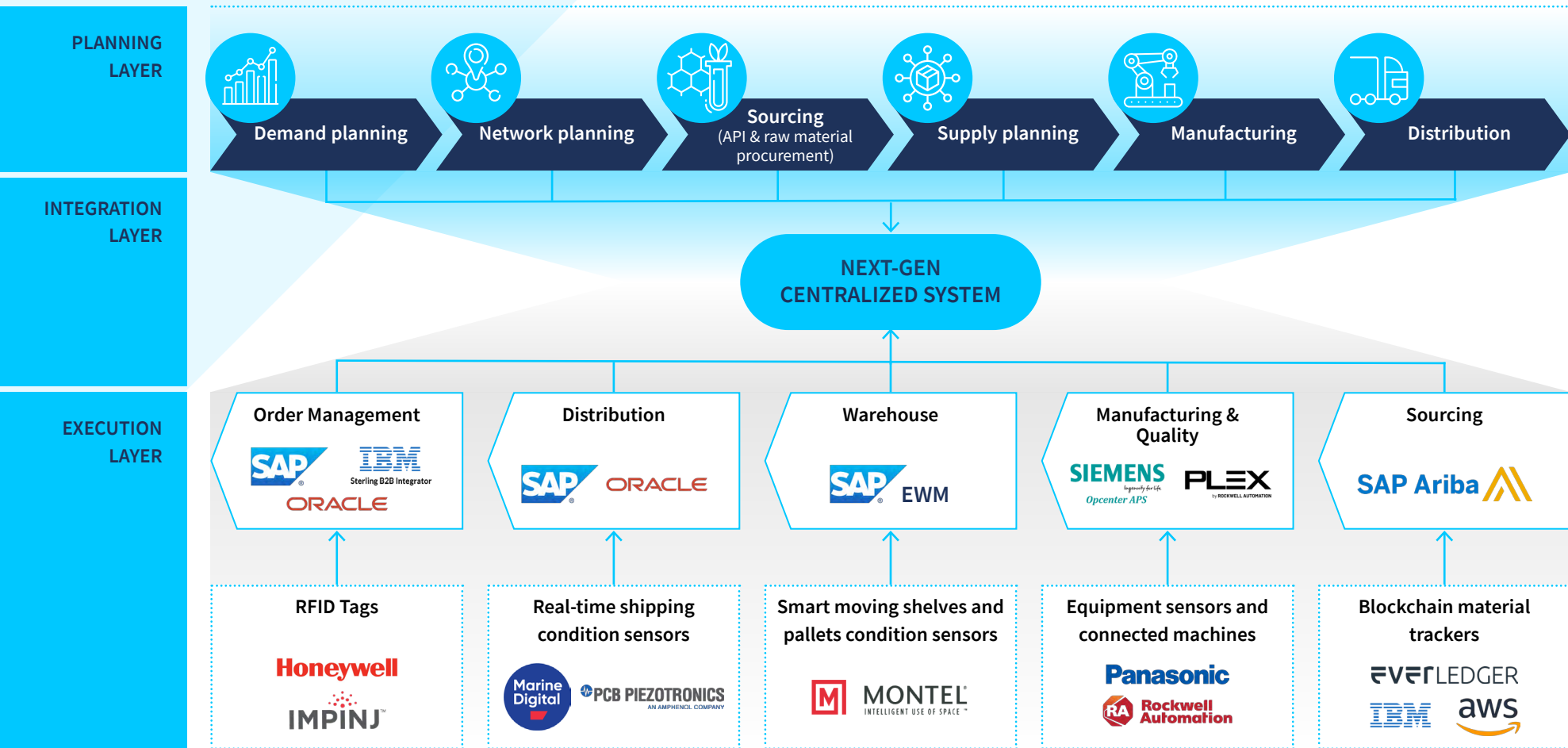
Digital twins enable a comprehensive and accurate representation of the supply chain in a digital format. By mirroring every aspect of the supply chain, from raw material sourcing to manufacturing processes and distribution networks, digital twins allow for an unprecedented level of insight and analysis. This real-time visibility across the E2E value chain facilitates the immediate identification of potential issues, the prediction of future challenges, and the formulation of strategic responses without the lag time traditionally associated with supply chain management.

The integration of digital twins into biotech supply chain management involves the deployment of various connected systems and technologies. **The planning layer**, for instance, incorporates advanced demand and network planning tools that utilize real-time data to forecast supply needs and optimize production schedules. **The integration layer** connects disparate elements of the supply chain, including order management, warehouse operations, and quality control, ensuring seamless communication and coordination across all functions. At **the execution layer**, technologies such as RFID tags and real-time shipping condition sensors provide granular, item-level tracking information, further enhancing visibility and control over the supply chain.

The benefits of implementing digital twins in the biotech supply chain are manifold. They offer a level of **flexibility and responsiveness** that is essential in today's fast-paced market, enabling companies to adapt quickly to changes in demand, supply chain disruptions, or regulatory requirements. Furthermore, the data-driven insights gained from digital twins support **more informed decision-making**, allowing for the optimization of operations, reduction of waste, and improvement of overall supply chain performance.

However, the transition to a supply chain model that incorporates digital twins is not without its challenges. It requires **significant investment in technology and infrastructure**, as well as a cultural shift towards data-driven management practices. Moreover, the success of digital twins depends on the quality and timeliness of the data they receive, highlighting the importance of **robust data collection and analysis systems**.

Exemplary connected systems for a digital twin



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SYSTEM

## Leverage Next-Generation Planning Solutions to Meet New Business Requirements

In the second step of implementing technological advancements, the **adoption of state-of-the-art planning solutions** represents a crucial pivot for biotech companies aiming to navigate the complexities of modern supply chain management. These advanced planning solutions, equipped with the latest in technology and analytics, are designed to address the new and emerging business requirements that challenge the biotech sector today.

The landscape of supply chain planning within the biotech industry is undergoing a significant transformation, driven by a **shift towards more integrated and responsive planning models**. Traditional, linear planning methods are being replaced by advanced systems that support **real-time, multi-dimensional scenario analysis and decision-making**. This evolution is not merely technological but reflects a broader shift in the industry towards a more agile and adaptive approach to supply chain management.

State-of-the-art planning solutions offer several key capabilities that are critical for biotech companies. First, they provide **enhanced E2E visibility** across the entire supply chain, from raw material sourcing to product delivery. This visibility is essential for identifying bottlenecks, predicting potential disruptions, and optimizing resource allocation. Second, these solutions incorporate advanced algorithms and artificial intelligence (AI) to **forecast demand more accurately, plan for supply variability, and optimize production schedules**. This level of sophistication allows companies to anticipate market changes and respond with agility, minimizing the impact of volatility on operations and customer service.

Moreover, the integration of these planning solutions facilitates a **more collaborative approach to supply chain management**. By connecting different parts of the organization and enabling data sharing and analysis in real-time, companies can break down silos and foster a culture of continuous improvement and innovation. This collaborative environment is vital for addressing the complex challenges that biotech companies face, from regulatory compliance to the management of global operations.

Implementing state-of-the-art planning solutions also positions biotech companies to **better leverage the growing volumes of data generated by their operations**. Through sophisticated data analytics and machine learning, companies can extract actionable insights from this data, driving strategic decisions that enhance efficiency, reduce costs, and improve overall supply chain performance.

## BACKGROUND








New capabilities are available in the area of supply chain management:

- ▶ Introducing of **E2E planning**
- ▶ Using and leveraging **advanced algorithms and AI**
- ▶ Enhancing **parameters and constraint planning**

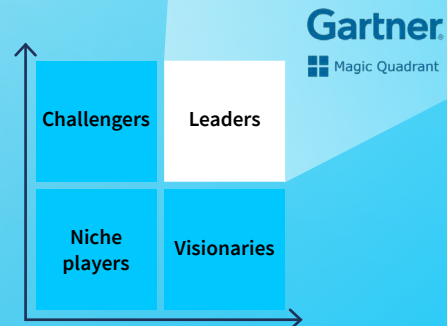
To **headstart against** competitors companies should:

- ▶ Enable **real-time E2E transparency** for manufacturing and logistics
- ▶ Leverage planning solutions for **concurrent planning**

## REQUIREMENTS SHIFT

	<b>Scheduling</b>	Basic, incremental	Advanced, real-time, parameter-driven
	<b>Constraint planning</b>	Single-level e.g. capacity	Multi-level
	<b>Scenario simulation</b>	Single-dimensional	Advanced, multi-dimensional, AI-supported
	<b>Supply chain planning</b>	Single-company	Cross-company
	<b>Resilience</b>	Basic visibility	Advanced management and active mitigation
	<b>Concurrent planning</b>	Consecutive planning	Concurrent planning and scheduling
	<b>C-level visibility</b>	Creation of presentations out of system	Dashboarding connection, real-time visibility

## KEY PLAYERS IN THE NEW ERA OF SUPPLY PLANNING





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SYSTEM

## Integrate Supply Chain Planning through AI

**Artificial Intelligence (AI) plays a vital role in transforming operations.** The pivotal integration of AI across the entire supply chain marks a significant leap toward **more intelligent, efficient, and responsive operations.** This integration is not merely an enhancement of existing processes but a fundamental reimagining of how supply chain functions can drive value and innovation in the biotech sector.

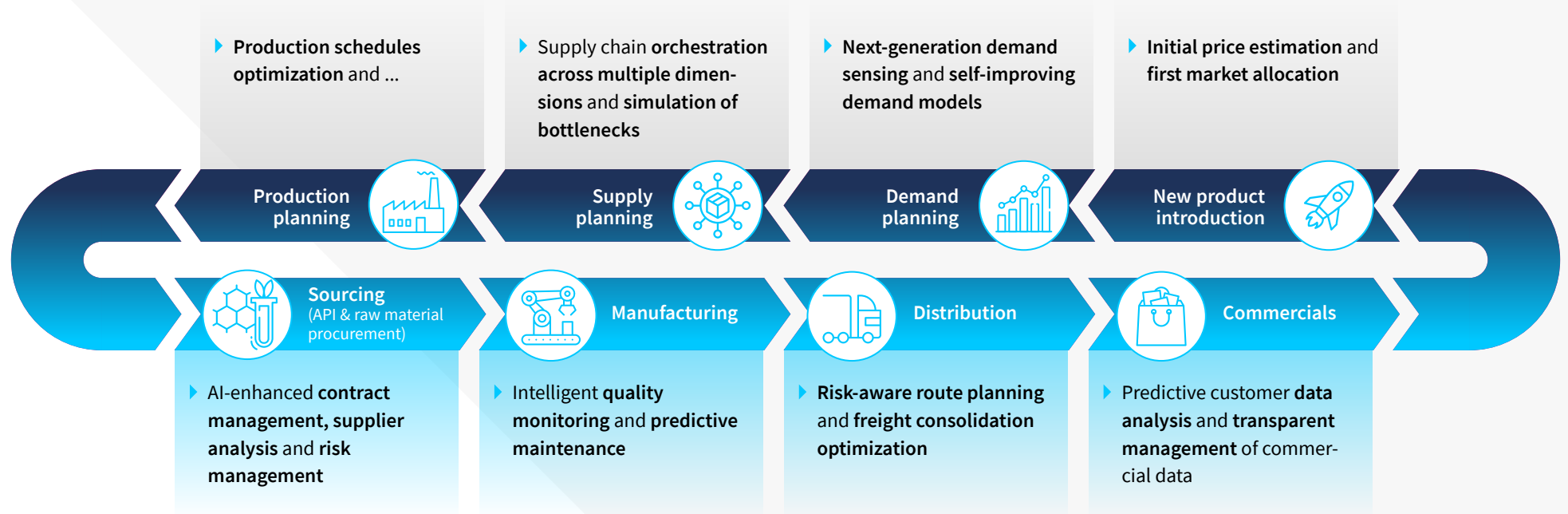
AI's application within the biotech supply chain is multifaceted, addressing critical areas such as production planning, supply planning, sourcing, demand planning, and manufacturing. Each of these areas benefits from **AI's capacity to process vast amounts of data, identify patterns, predict outcomes, and recommend optimal actions.** For instance, in production planning, AI algorithms can optimize schedules and resources, reducing waste and increasing throughput. Similarly, in demand planning, AI can **enhance accuracy** by analyzing historical data, market trends, and consumer behavior, ensuring that supply aligns closely with actual market demand.

One of the most transformative aspects of AI in supply chain management is its ability to **orchestrate operations across multiple dimensions.** By simulating various scenarios and analyzing potential bottlenecks, AI enables decision-makers to anticipate issues and implement proactive strategies. This level of orchestration is critical in navigating the complexities of global biotech supply chains, where variables such as regulatory changes, market dynamics, and logistical challenges can have significant impacts.

Furthermore, AI enhances risk management and supplier analysis within the sourcing function. Through intelligent analysis of supplier performance data, market conditions, and risk factors, companies can make informed decisions about **supplier selection, contract management, and contingency planning.** This proactive approach to risk management is essential in maintaining the integrity and resilience of the supply chain.

The integration of AI also extends to the manufacturing process, where it supports **quality monitoring and predictive maintenance.** By predicting equipment failures before they occur and optimizing maintenance schedules, AI can reduce downtime and ensure consistent product quality. In distribution, AI applications such as risk-aware route planning and freight consolidation optimization offer the potential to significantly enhance logistical efficiency and reliability.

### EXEMPLARY AI LEVERS ACROSS VALUE CHAIN



### BENEFITS

Three main benefits of enhancing value chain with AI-enabled tools and areas most impacted:



**Automate** repetitive tasks and enable predictive planning  
*Demand planning and supply planning*



**Simulate** and help to predict events  
*Supply planning and distribution*



Enable better, more **data-driven, strategic decision-making**  
*New product introduction and sourcing*

# Conclusion

The seven outlined strategic levers can drive transformation across different operational areas, from reorganizing operational departments to fostering a culture of innovation and continuous improvement. The benefits of these levers extend beyond operational efficiencies, **impacting write-offs, capital expenditure (CAPEX), operating expenses (OPEX), revenue, headcount, productivity, and resilience**. It is through the deliberate application of these levers that biotech companies can navigate the complexities of modern supply chains, **ensuring they are equipped to deliver life-saving treatments to patients with unprecedented speed and efficiency**.

**In conclusion, this paper provides a roadmap for biotech companies seeking to navigate the complexities of the 21st century.** By embracing organizational empowerment, technological innovation, and strategic foresight, companies can transform their supply chains into dynamic, responsive networks capable of meeting the challenges of today and seizing the opportunities of tomorrow. The journey towards a transformed supply chain is complex and requires a commitment to change, investment in technology, and a shift in corporate culture. However, the rewards—a **supply chain that is not only more efficient and resilient but also a strategic asset in the quest to improve human health**—are immeasurable.

As we look to the future, it is clear that the biotech industry stands on the brink of a **new era in supply chain management**. The successful adoption and integration of the strategies outlined in this document will not only define the leaders of tomorrow but also ensure that the biotech industry continues to fulfill its vital role in advancing human health and well-being.

### Supply chain levers bring benefits across different operating areas

Level	Write off	OPEX	CAPEX	Revenue	Headcount	Productivity	Resilience
1 Reorganize operational departments	—	☆☆☆	—	—	☆☆☆	☆☆☆	—
2 Shift supply chain roles	—	☆☆☆	—	—	☆☆☆	☆☆☆	—
3 Increase responsiveness in planning	☆☆☆	—	—	☆☆☆	—	☆☆☆	☆☆☆
4 Introduce state-of-the-art resilience levers	—	—	—	☆☆☆	—	—	☆☆☆
5 Establish E2E real-time transparency	☆☆☆	—	☆☆☆	☆☆☆	—	—	☆☆☆
6 Leverage next-generation planning solutions	—	☆☆☆	☆☆☆	—	—	☆☆☆	☆☆☆
7 Integration of supply chain planning through AI	—	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆	☆☆☆

☆☆☆ Levers impact on specific operating areas. The higher the score the better.

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## CAMELOT Management Consultants

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- CAMELOT is a recognized global consulting leader for value chain management. For more than 25 years we have been helping our clients transform their value chains into competitive advantage – from strategy to tangible business value.
- We are practitioners with a first-hand understanding of your industry's challenges, trends, and leading practices. With industry-specific blueprints and approaches, we guide quick value capture.
- CAMELOT effectively connects strategy with data science, digital solutions, and implementation skills, using an agile concept development approach to drive superior business value.

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