Deloitte.

Building operational resilience and agility

Introduction

The past few years have seen many disruptions creating a ripple effect throughout the supply chain networks and ecosystem. Examples include the COVID-19 pandemic, semiconductor chip shortages, ocean freight price volatility, trucking shortages, and many more that have proven the need to necessitate a paradigm shift in the traditional recovery approach of global supply chains. Along with the near-term imperative of financial viability, organizations are also deliberating about a long-term strategic response mechanism, trying to pursue two key objectives: first, recovery from short-term disruptions (be more resilient) and second, grow ahead of peers to sense and prepare for fundamental shifts in demand and supply (be more agile).

Supply chain disruptions: An ongoing challenge

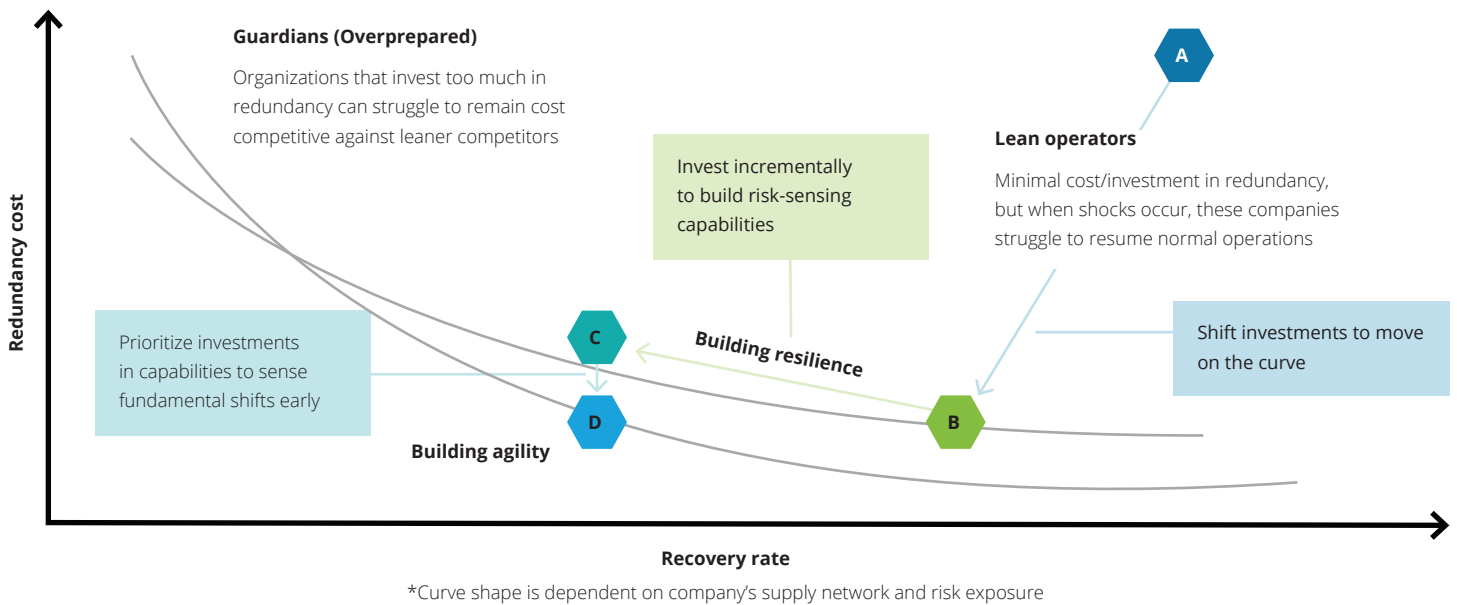|		
"Hundreds of ships trapped by Ukraine War, endangering sailors and global trade; port closings and missile strikes on vessels have ripple effects on trade"	*WSJ*[1] March 8, 2022	The increasingly interconnected nature of supply chains and the increasing frequency of these disruptive events puts a spotlight on global organizations' ability around operational resilience and agility.
"Canadian protests that began by championing the rights of truckers have spread into anti-establishment demonstrations—shuttering crucial trade links"	*Bloomberg*[2] February 11, 2022	
"Shortage of 80,000 truck drivers is wrecking havoc on the supply chain—and it's about to get worse"	*Fortune*[3] October 28, 2021	**Operational resilience** A supply chain's ability to **absorb, respond, and recover back** to an existing state after a supply or demand shock
"Supply chain chaos is already hitting global growth. And it's about to get worse"	*CNBC*[4] October 18, 2021	
"UK supply chain crisis to last until at least 2023, business leaders warn"	*The Financial Times*[5] October 19, 2021	
"As the overall demand for chips increases, the manufacturers simply don't have the capacity to meet the demand in the time required"	*Forbes*[6] July 13, 2021	**Operational agility** A supply chain's ability to **evolve quickly and profitably,** especially relative to competitors in response to a fundamental shift in supply or demand
"Supply chain disruptions and healthcare worker shortages will continue to pressure medical product and device companies in 2022"	*WTWH*[7] February 8, 2022	
"A tiny part's big ripple: Global chip shortage hobbles in the auto industry"	*NYT*[8] April 23, 2021	

A renewed focus on operational resilience and agility is essential now, more than ever, to help businesses absorb short-term shocks and evolve during long-term shifts. However, organizations must go through a transformational journey to build resilience and agility.

The journey to operational resilience and agility

Operational resilience and agility can be attributed to two key characteristics: (1) ability to quickly recover from the shock, and (2) ability to use the shock as opportunity to grow. Supply chain organizations should commence the journey (figure 1) by improvement in planning, impact mitigation, and growth capabilities while simultaneously achieving coordination among the supply chain ecosystem partners.

Figure 1. Journey to operational resilience and agility

Guardians (Overprepared)

Organizations that invest too much in redundancy can struggle to remain cost competitive against leaner competitors

Invest incrementally to build risk-sensing capabilities

Lean operators

Minimal cost/investment in redundancy, but when shocks occur, these companies struggle to resume normal operations

Shift investments to move on the curve

Prioritize investments in capabilities to sense fundamental shifts early

Building resilience

Building agility

Recovery rate

Redundancy cost

*Curve shape is dependent on company's supply network and risk exposure

Redundancy cost: Investments in building capabilities that promote overall growth but restrict flexibility
Recovery rate: Time taken by organization to absorb disruption and return to normal operations

"Shifting the curve"

Beginning the journey (A → B)

Today, many companies have built redundancies that do little to address the prevalent risk exposure. They need to shift their investments to value-add activities to move toward the risk curve.

Building resilience (B → C)

Companies can build resilience by investing in additional supply chain capabilities to mitigate the risk exposure from network shock. Essentially, they are building up "defenses" to prepare them when unforeseen events occur.

Building agility (C → D)

Leading organizations are building agility in addition to resilience. They are enabling best-in-class risk-sensing capabilities, prioritizing actions based on predictive models and real-time alerts, and building flexible and nimble operations. They operate on a different cost curve because they know which risks matter most and which actions to prioritize rather than taking a one-size-fits-all approach.

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Deloitte's approach to building operational resilience and agility

In recent times, multiple incidents have exposed the vulnerabilities of global supply networks. Organizations are constrained with limited visibility into issue identification, or understanding the impact of issues on their supply chain, and are farther away from acting upon resolution mechanisms in real time. Let's take the example of the effect of the COVID-19 pandemic. Immediate lockdowns in several countries led to unavailability of supply to plants and led to cascading effects on customer service, demand volatility, and earnings impact. Further, there was limited visibility across the ecosystem into sources of supply, logistics tracking, labor availability, impact on service level agreements, etc. Deloitte recommends building operational resilience and agility using our **Illuminate-Sense-Act** approach to address these pertinent issues.

Illuminate
Building a connected supply chain and defining KPIs that measure resiliency and risk

- **Connect multiple data/ERP systems** along with external data sources through API-based data ingestion for single source of truth
- Define and measure resilience and agility KPIs for the ecosystem
- **Connect all regions, internal and external stakeholders** such as suppliers, and customers for supply chain ecosystem visibility

Sense
Sensing risks through algorithms that scan digital twin components, model supply chain constraints, and identify impact

- Identify **critical supply chain issues and exceptions** to be addressed for dynamic capacity management
- Model the supply chain to **simulate risk across the ecosystem** disrupting normal operations
- Apply **advanced analytical capabilities** to get predictive insights for optimal business scenarios
- **Identify the root causes** to business issues and exceptions

Act
Acting on information through risk sensing and implementing technology-enabled solutions for organizational transformation

- **Enable supply chain flexibility** by developing actionable recommendations alongside impact assessment scenarios
- Orchestrate a **collaborative response** among supply chain ecosystem partners based on automated prescriptive recommendations
- Trigger **automated decisioning and actions** on alerts generated by proactive models

Example of building resilience

How a US-based global automotive original equipment manufacturer (OEM) was able to identify and mitigate potential impact from emerging supply disruptions

During COVID-19, a US-based global automotive OEM faced supply disruption from the countries that implemented lockdowns. Limited visibility to N-Tier suppliers made it difficult for the OEM to identify the nodes disrupted. It started building Value Stream Maps (VSMs) by contacting Tier 1 suppliers and modeling alternate planning scenarios to minimize the impact. However, this was manually intensive, taking approximately a week for one person to build an entire VSM for a Tier 1 supplier and then modeling scenarios. Deloitte partnered with the OEM to help illuminate the supply chain and identify nodes disrupted using advanced technologies.

What did the OEM do?

Illuminate

The OEM used internally and externally available commercial artifacts to identify its value chain starting from Tier 4 suppliers to Tier 1 suppliers. It helped the OEM build a geospatial map with all the interdependent value chains mapped with product categories, parts, and end production locations. Through the map, the OEM was able to immediately identify the nodes impacted from COVID-19 pandemic-induced lockdowns, potential supply disruptions of all the parts, and the production locations impacted. One quick insight was that uncovering network dependencies of only the top 10% of suppliers by spend would help the OEM achieve gaining visibility into approximately 50% of its Tier 1 supply networks.

Sense

The OEM developed a risk catalog that it configured in a real-time alerts algorithm to identify emerging threats globally. The OEM was able to identify suppliers that could be potentially impacted though the emerging supply chain disruptions, allowing the OEM to directly connect with the suppliers to validate the impact. The OEM then reconfigured its planning algorithms to model the supply disruption impact on respective plants and customer locations. It was able to assess the capacity constraints developed in the value chain that then redirected to identify alternate locations to get supply from, arrange expedites, and change production plans to have minimal impact on the end customers.

Act

The OEM used the ecosystem map to identify alternate sources of supply and reconfigure the supply chain network for minimal impact to production plans and customer demand. The procurement organization immediately contacted alternate suppliers, formally onboarded them, and blocked the available capacities. This helped the OEM to secure supply continuity in an already constrained ecosystem and fulfill the demand accordingly.

Meanwhile, the organization also utilized these capabilities to identify the source for other supply chain disruptions such as the global semiconductor chip shortage. The OEM launched a targeted industry benchmarking of leading capabilities and advanced tools that can help it build a long-term impact-resilient supply chain.
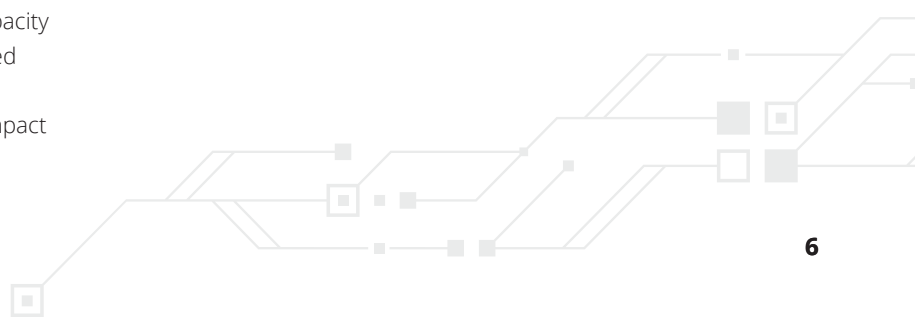
How to build resilience

The first step toward building operational resilience is to identify the nodes that are potential sources for disruptions and understand the supply chain interdependency of all the ecosystem partners associated. All the ecosystem needs is to connect a digital core that continuously and automatically monitors risks across internal and external operations. Here are the key activities that organizations should do to build resilience.

Table 1. Key elements of building resilience

Key considerations to build resilience					
	How to illuminate Identify where your partners are located	**Collect data** Gather industry/commercial artifacts (e.g., BOL), value stream maps, BOMs	**Illuminate** Use AI/NLP engine to scan artifacts and generate list of players in the value chain	**Screen** Screen the list based on products and customers to arrive at the final list of ecosystem partners	**Model** Model the supply chain and develop a digital twin to visualize the flow of goods
	How to sense Identify the potential supply disruptions and assess impact	**Identify relevant risks** Identify risk domains that are required to be scanned (e.g., operational, financial)	**Sense risk** Use data aggregators to gather information on ecosystem partners across risk domains	**Simulate impact** Simulate the risks on the ecosystem and measure the impact on operations	**Prioritize** Prioritize the risks to act on and identify ecosystem partners to collaborate with
	How to act Identify action points and prioritize based on speed to value	**Draft action plan** Engage stakeholders and identify mitigation plans; conduct benefit trade-off analysis on each plan	**Assess** Assess the current data, technology, and process readiness for each action plan	**Priorities** Prioritize the implementation based on speed to value and ease of implementation	**Monitor** Monitor the progress along with the cost and benefits achieved to align with corporate objectives

Deloitte has developed a rich taxonomy of potential risks that we help organizations identify and track across risk domains.

Overview	Operational	Financial	Compliance	Reputational	Events
	Risks that impact overall operational capacity to supply products on time (e.g., capacity risk, labor risk)	Risk where an ecosystem partner doesn't have enough cash to support operations (e.g., insolvency risk)	Risk where an organization fails to comply with existing regulations (e.g., lawsuits, cyber risk)	Events that impact overall brand image of the ecosystem partner (e.g., brand risk, political stability)	Events that impact the capability for on-time delivery (e.g., fire incidents, COVID-19 lockdown)

Action plans built to respond to these risks and recover are balanced on investment return and risk and are continuously monitored to align with corporate strategies. Deloitte leverages ready accelerators to quickly identify and assess multiple action plans along with as-is capabilities across people, process, and technology to uncover gaps and align globally and cross-functionally on a prioritized implementation plan.

For continuous monitoring of resilience, Deloitte helps clients define and measure index-based KPIs for resilience based on key attributes that are consolidated to drive an aggregate score. The major elements of the index are (1) **Capacity buffer:** Measured as excess capacity, inventory, and cash at each node; (2) **Execution speed:** Measured as operational lead time (supplier lead time, manufacturing lead time, etc.); and (3) **Supply chain visibility:** Measured as availability of operational information of partners and facilities (networks, inventory, OEE, etc.).

Building resilience is a strategic imperative that can be accelerated by advancements in digital twin capabilities, risk-sensing capabilities, and an organization's overall ability to manage and rapidly respond to information. With its cognitive risk-sensing engine, Deloitte helps identify a customized set of disruption events and by node, model the "length and likelihood of disruption" and "KPIs affected." We simulate the parameters at each node to gauge the "recovery rate" and deliver deep understanding of issues around capacity and delivery performance.
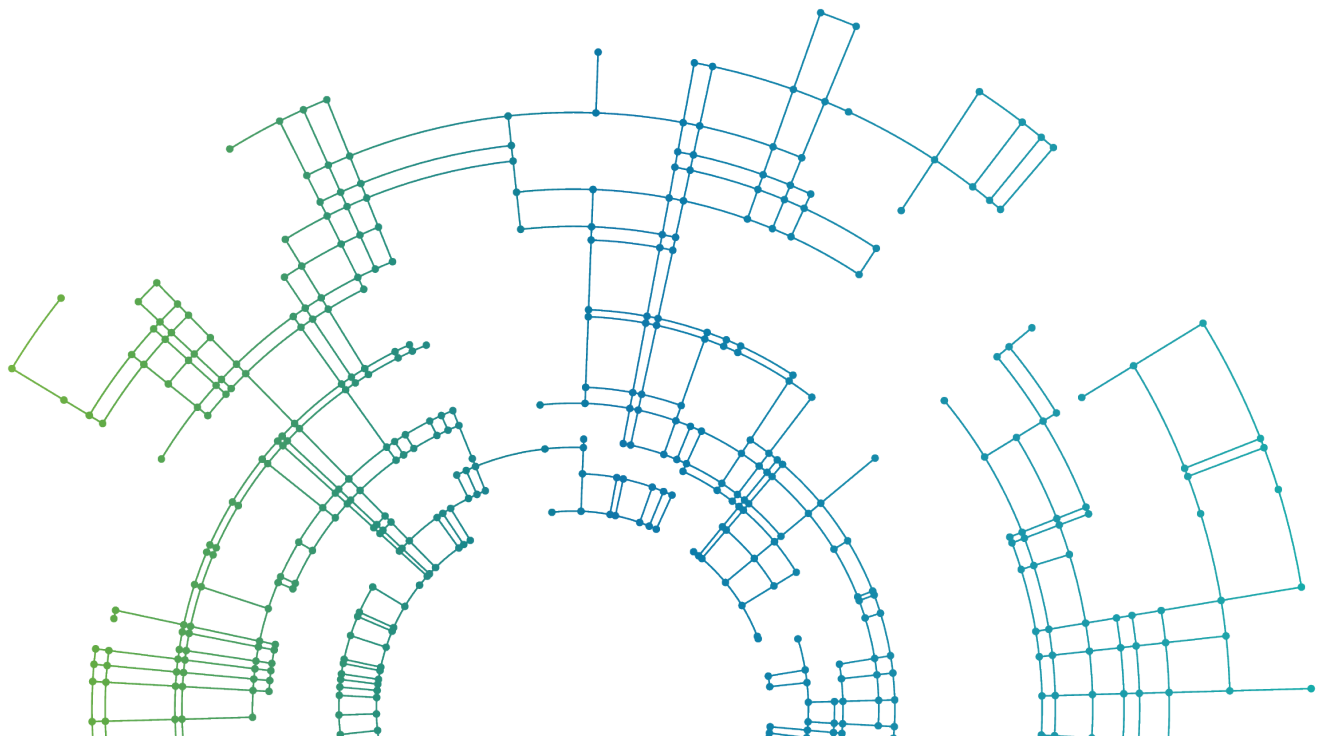
Example of building agility

How a dairy cooperative increased revenue by $98M during the COVID-19 lockdown[9]

The dairy industry struggled to meet supply and demand during COVID-19-Induced lockdowns. When the lockdown was first announced, the dairy industry could operate under certain restrictions as the product categories were considered essential services. However, demand-generating businesses such as in the hospitality sector—which accounted for 20% of organized revenue for the dairy industry—were closed, which resulted in a significant dip in demand. As a result, the majority of dairy companies cut back their procurement and supply chain logistics to reduce costs. While companies were struggling to keep their supply chains intact, an India-based cooperative went on to introduce 33 new products in the market, procured an additional 3.5 million liters of milk every day, and paid $104 million to milk suppliers.

What did the OEM do?

Illuminate

The company had invested in strategic partnership to create a digital twin of the company's supply chain ecosystem including supplier locations, plants, and customers or retailers. The system has the capability to identify which plants are operating at what capacity, how many trucks are operational at any point in time, and any cumulative idle capacity left.

Sense

The state cooperative identified an important factor responsible for demand variability: consumer behavior. Even after no demand from business, the household consumption of milk increased as more people were at home. They began tracking the transactions in the retail sector and identified that more households were buying packaged groceries. Through its customer demand-sensing capabilities, the company was quick to identify that demand for dairy-based products had increased. For example, cheese saw the demand surge by 80%, and demand for condensed milk doubled. However, demand for frozen products had decreased.

Act

The company quickly shifted gears to operate its plants at 115% capacity to close gaps between supply and demand. It also identified other factories that had closed that they could use to increase production capacity. The company used its digital twin to identify idle capacity from the frozen products business and distribute the load accordingly. To match production with distribution, the co-op started using rail transport, which was operated by the government for essential services. On the sales front, the company landed partnerships with multiple e-commerce players to sell and ship products, which provided the co-op more market share on the ground. To sell more products, the company also increased its advertisement volumes to 316% compared to 2019.

The company was able to quickly reconfigure its agile supply chain ecosystem through the digital twin capability to sell more products and manage crises better.
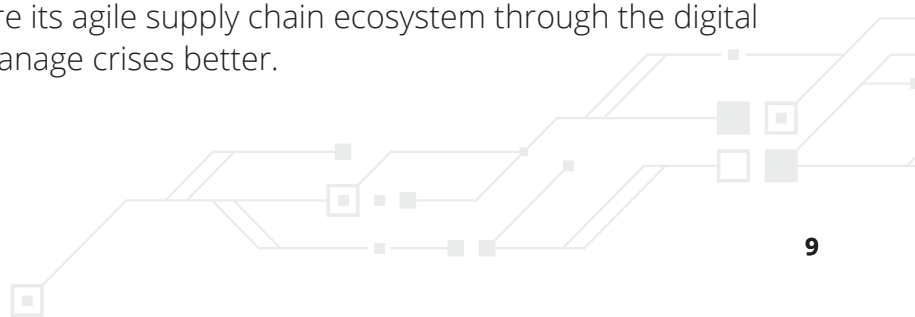
How to build agility

The first step toward achieving agility is to map the supply chain ecosystem with real-time data on inventory, supply, distribution, production capacities, and customer demand. The key is to be able to assess and analyze transactional data to generate insights on paradigm shifts in supply chain and customer demand quickly.

Table 2. Key elements of building agility

|				
How to illuminate Create a digital map of your operational resources	**Data architecture** Build out an EDI/API-enabled data architecture that aims to connect multiple systems	**Centralized data repository** Build a centralized data lake for a single source of truth	**Automation** Create automated links to platforms to provide visibility across the supply network	**Global orchestration** Connect all regions and external stakeholders for E2E visibility and optimal business decisions
How to sense Identify shifts in demand and supply	**Customer analytics and demand sensing** Continuously improve understanding of consumer demand through better customer and sales analytics		**Supply chain modeling** Proactively model supply chain with emerging constraints and shifts to match supply with consumer demand	
How to act Identify action points to improve growth	**Demand consensus** Continuously improve forecast and market share with better product mix and forecast accuracy	**Supply consensus** Deploy supply and capacity to align on consumer priorities and cost-saving mechanisms	**Plan consensus** Evaluate business scenarios to identify gaps and develop optimized plan to fulfill orders	**Finance consensus** Review for plan alignment with financial goals, and strategize steps through revenue planning

Key considerations to build agility

The new global supply chain environment forces organizations to consider numerous challenges to achieve simultaneous, integrated, and real-time planning capabilities. Here are some of the illustrative examples on how Deloitte can continuously sense shifts in supply and demand and be ready to respond.

Table 3. Illustrative examples of capabilities that are necessary to sense shifts in supply and demand

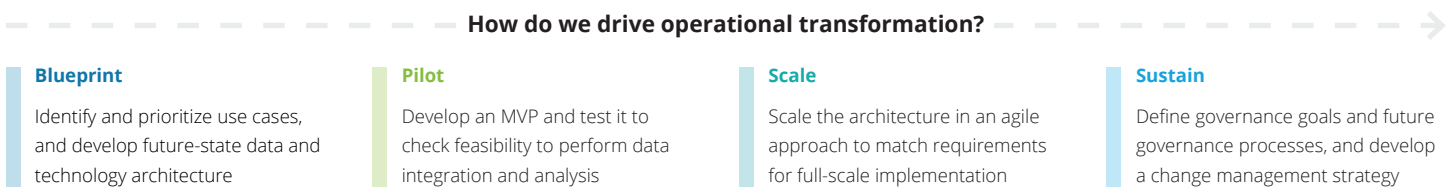| Customer analytics and demand sensing	Supply chain modeling
Customer analytics Customer segmentation and clustering to identify high-value areas and the right product mix	**Inventory assessment and stock rebalancing** Identify rightsize inventory at part-location level to meet desired service level across the network, based on consumer demand changes
Forecast accuracy Drill-down analytics on forecast accuracy, bias, and forecast value-add with root-cause analysis incorporated into plans and discussions	**Capacity assessment** Model capacity and generate alerts based on current utilization effectiveness to meet growing demand incorporating demand forecasting results
Sales analytics Collaboration tools to track changes in assumptions across functions, and appropriate aggregation/disaggregation for marketing vs. sales vs. supply	**Order fulfillment analytics** Enable active order fulfillment tracking, back-order management, and alerts to identify service-level gaps

For continuous monitoring of agility, Deloitte helps clients define and measure index-based KPIs for agility based on key attributes that are consolidated to drive an aggregate score. The major elements of the index are (1) **ecosystem integration:**[10] Enablement of E2E planning through integration of systems in the ecosystem to manage two-way sharing of information; (2) **process integration:** Innovation potential (R&D) and vertical integration of partners in the ecosystem leading to rapid change adoption; and (3) **market sensitivity:** Measured as speed and number of new product introduction with respect to customer sensitivity and trends.

Connecting multiple data/ERP systems with a centralized data lake and being able to harmonize data across the organization is a steppingstone for building agility. Organizations should devise a go-forward plan for the next five years and continuously build and refine data architecture based on updates and requirements. Along with that, organizations will need an advanced analytics layer to streamline processes with alerts, and AI and machine learning for faster market reactions and deeper customer insights.
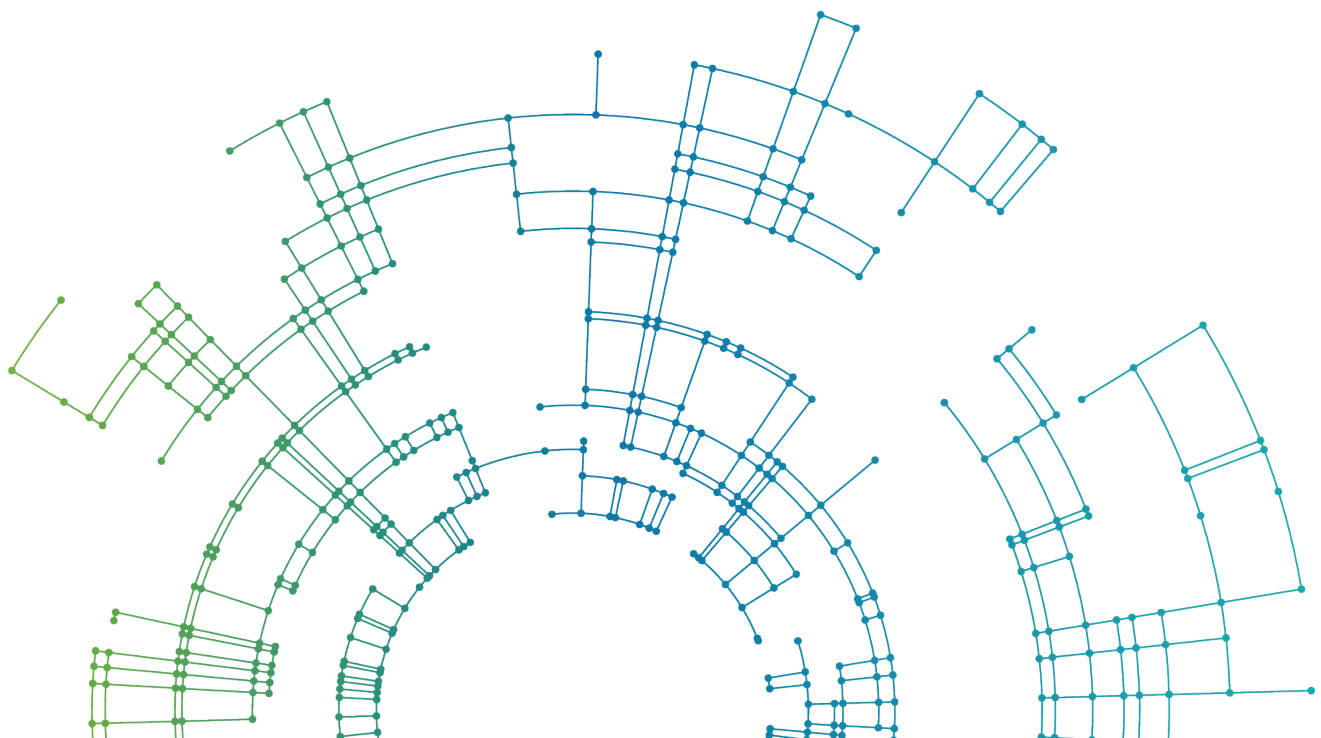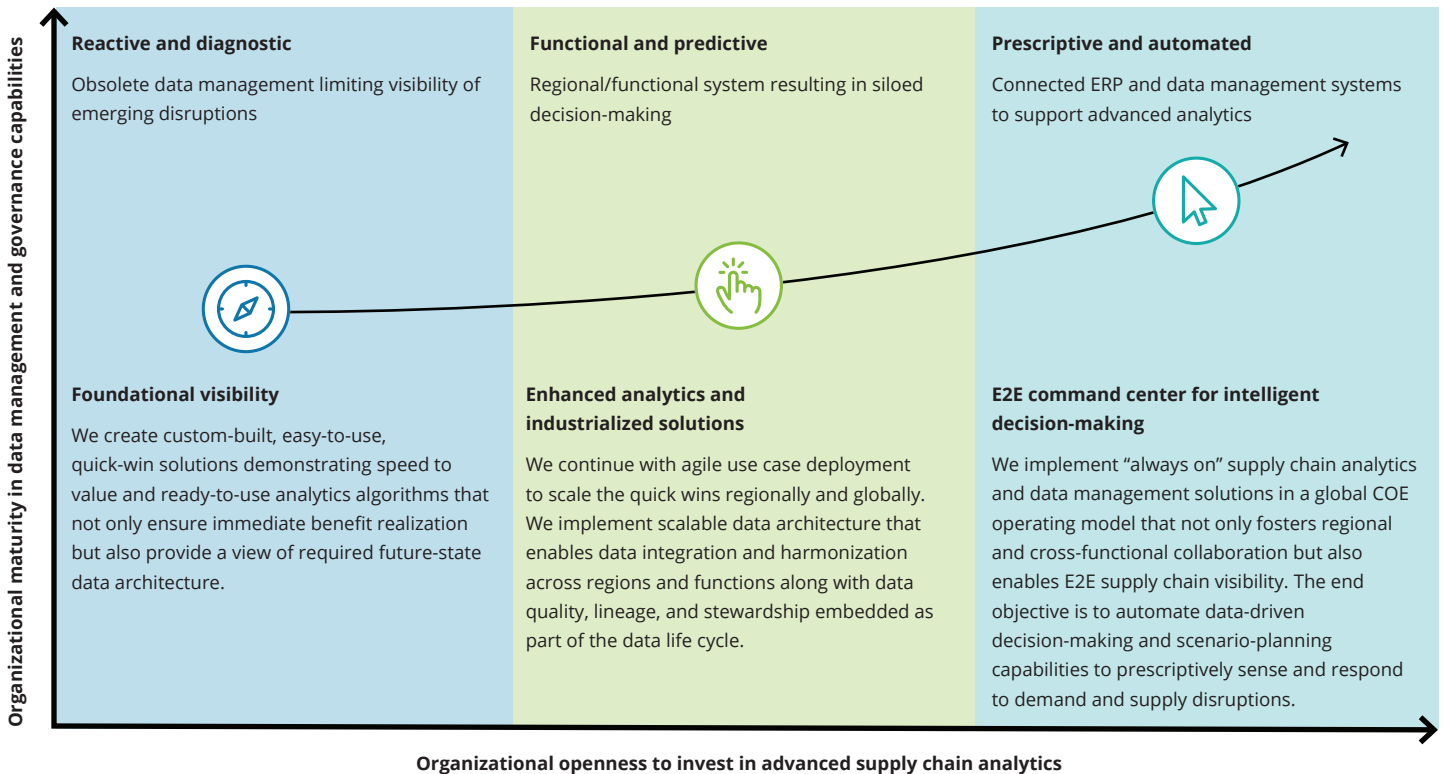
How Deloitte can help

Deloitte brings a robust suite of data and technology accelerators and digital FTEs that expedite implementation of solution architecture and rollout of use cases and technical capabilities. We customize these tools and accelerators to suit organizations' requirements and deliver a minimum viable product (MVP) that establishes feasibility and creates a self-funding mechanism to drive full-scale implementation using an agile approach. Further, we help our clients transform their supply chain analytics capabilities through our custom-built solutions, enhanced ERP capabilities, and "always on" digital supply chain solution.

- - - - - - - - - - - - - - - - - **How do we drive operational transformation?** - - - - - - - - - - - - →

Blueprint	**Pilot**	**Scale**	**Sustain**
Identify and prioritize use cases, and develop future-state data and technology architecture	Develop an MVP and test it to check feasibility to perform data integration and analysis	Scale the architecture in an agile approach to match requirements for full-scale implementation	Define governance goals and future governance processes, and develop a change management strategy

Figure 2. Deloitte assists clients during their transformational journey

Y-axis: Organizational maturity in data management and governance capabilities

Reactive and diagnostic
Obsolete data management limiting visibility of emerging disruptions

Functional and predictive
Regional/functional system resulting in siloed decision-making

Prescriptive and automated
Connected ERP and data management systems to support advanced analytics

Foundational visibility
We create custom-built, easy-to-use, quick-win solutions demonstrating speed to value and ready-to-use analytics algorithms that not only ensure immediate benefit realization but also provide a view of required future-state data architecture.

Enhanced analytics and industrialized solutions
We continue with agile use case deployment to scale the quick wins regionally and globally. We implement scalable data architecture that enables data integration and harmonization across regions and functions along with data quality, lineage, and stewardship embedded as part of the data life cycle.

E2E command center for intelligent decision-making
We implement "always on" supply chain analytics and data management solutions in a global COE operating model that not only fosters regional and cross-functional collaboration but also enables E2E supply chain visibility. The end objective is to automate data-driven decision-making and scenario-planning capabilities to prescriptively sense and respond to demand and supply disruptions.

X-axis: Organizational openness to invest in advanced supply chain analytics

Deloitte can reduce time-to-value for our clients by drawing upon our project accelerators:

- **Formal alliances with 60+ organizations** and deep experience implementing leading advanced planning systems and ERP solutions

- **10+ industry process blueprints** and IBP playbooks to jump-start and accelerate digital transformations

- **20+ assets and accelerators** to jump-start your planning analytics transformation

- **Robust library** with 30+ proprietary algorithms and 350+ visual prototypes

Our experience with resiliency and agility solutions

Deloitte has executed more than 20 engagements specifically focused on operational resilience and agility and more than 100 programs focused on end-to-end supply chain visibility. These engagements were delivered for a variety of risk types, each resulting in benefits for our clients.

Global energy conglomerate

- Sensed aftermarket stockout risk through a control tower solution
- Implemented a "parts relocation program" that moved critical spare parts to optimal location in network
- Reduced inventory costs by approximately $30 million while maintaining best-in-class service levels (95%+)

Global consumer packages goods providers

- Developed an inbound logistics performance and cost visibility solution with automated data feeds from third-party logistics carriers to enable a single view of all inbound logistics cost and performance metrics
- Consolidated reporting by 66% into one stand-alone solution and enabled $4 million of annual inbound logistics cost savings

Global construction equipment OEM

- Prioritized more than 1,000 suppliers into four different actionable buckets based on levels of risk
- Stood up a physical Assurance of Supply Center at the client's corporate headquarters equipped with real-time monitoring capabilities
- Developed a robust case management process to address identified supplier risks

Global medtech OEM

- Developed an intelligent ventilator allocation use case, helping the OEM identify ventilator supply and demand mismatch during COVID-19 and fulfill demand at providers
- Developed a control tower solution that identifies forward-looking utilization down to the facility level and projects potential surplus and shortage of ventilators

Global auto OEM

- In one week, identified 172 additional T2 suppliers and 460 T3 suppliers through illumination that the OEM was not aware of
- Explored 800,000 external open data sources to collect information on channel partners
- Curated more than 46,000 relevant signals across 11 risk domains and five key areas to produce a single report highlighting risk trends

US-based major airline

- Provided consolidated analysis of the supplier landscape to categorize suppliers based on risk and impact to drive strategic decisions on intervention, renegotiation, and consolidation
- Provided supplier-specific analyses for performance monitoring, including KPIs to identify bad performance trends and overdue orders
- Developed executive snapshots of supplier performance across KPIs in delivery, quality, and reliability to drive Root Cause and Corrective Action

Health care provider

- Ongoing monitoring program provided by Deloitte, leveraging proprietary CentralSight™ technology, picked up signals about a potential shortage of phlebotomy supplies more than three weeks before it became common knowledge
- Program proactively identified alternative supply options and verified vendor legitimacy, giving client ability to gain up to 120 days of safety stock before manufacturers started putting customers on allocation
- The provider avoided nearly $450,000 in cost without jeopardizing quality of patient care

Why Deloitte?

At Deloitte, we tailor our approach to specific client needs—no matter where you are in your journey to building operational resilience and agility—by taking a collaborative, iterative approach emphasizing speed to value.

Ecosystem orchestration: We apply our digital tools and accelerators to expedite the collection of data and model the entire ecosystem of global supply chains and partners.

Advanced analytics: We use cognitive technologies like AI to mine data, simulate events, and identify the weakest links to the supply chain and opportunities that matter to your organization.

Global technology alliances: We have strong alliances with more than 60 global technology partners to bring you complete, scalable, and custom-made solutions that can help you not only survive but also thrive in the world of dynamic supply chains.

Data repository: We expand your risk awareness and insight by drawing from robust internal data sets and intellectual property (e.g., KPI library, prebuilt maturity models, and risk taxonomy), as well as more than 1,200 third-party data sources.

Global team: With more than 3,000 dedicated supply chain professionals solving complex supply chain issues in more than 150 countries, our talent teams bridge the gap between traditional business and evolving supply chain challenges.

Speed to value: Our ready-to-configure assets can be deployed in weeks, not months. Given our cross-industry domain capabilities in supply chain and technology, we have the unique capacity to use digital tools to drive enduring solutions.

A global leader in operational transformation

- A leader in Data and Analytics Service Providers, Magic Quadrant, 2022 by Gartner[11]

- A leader in Public Cloud IT Transformation Services, Magic Quadrant, 2022 by Gartner[12]

- A worldwide leader in Business and Industrial IoT Consulting and Systems Integration Services Vendor Assessment, 2020 by IDC[13]

- A worldwide leader in Artificial Intelligence Business Services Vendor Assessment, 2021 by IDC[14]

- A leader in European Cybersecurity Consulting Providers, 2021 by Forrester[15]

- A leader in Innovation Consulting Services, 2021 by Forrester[16]

With several operational resilience and agility engagements for some of the world's largest, most complex enterprises, Deloitte knows what best-in-class looks like and how to take you there. With mastery in applying technology to illuminate the supply chain ecosystem and simulate disruptions along with change management capabilities, Deloitte helps you avoid potential pitfalls in operational transformation, seize opportunities, and rapidly mature your organization's operational resilience and agility to be more prepared to manage supply chain disruptions.

Ready to build operational resilience and agility? Contact us.

There's no time to waste. Deloitte knows how to help take you quickly to a future state where risk is managed, opportunities are seized, and supply is assured. Please reach out to discuss your challenges and vision for building operational resilience and agility.

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Endnotes

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2. Brian Platt and Josh Wingrove, "How trucker protests shut the Canadian border and rocked the economy," *Bloomberg*, February 11, 2022.

3. Nicole Goodkind, "A shortage of 80,000 truck drivers is wreaking havoc on the supply chain—and it's about to get worse," *Fortune*, October 28, 2021.

4. Holly Ellyatt, "Supply chain chaos is already hitting global growth. And it's about to get worse," CNBC, October 18, 2021.

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6. Richard Howells, "How semiconductor shortages have taken a chip out of the global supply chain," *Forbes*, July 13, 2021.

7. Jim Hammerand, "Moody's warns of continued supply chain and labor problems for medtech," *Medical Design & Outsourcing,* February 8, 2022.

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9. Think School, "How Amul beat its competition & made 39,200 Cr during lockdown?: Business case study," YouTube, August 3, 2021.

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11. Jorgen Heizenberg et al., "Gartner: Magic Quadrant for Data and Analytics Service Providers," Gartner, February 7, 2022.

12. Mark Ray et al., "Gartner: Magic Quadrant™ for Public Cloud IT Transformation Services," Gartner, July 20, 2022.

13. Mukesh Dialani et al., "IDC MarketScape: Worldwide Business and Industrial IoT Consulting and Systems Integration Services 2020 Vendor Assessment," IDC MarketScape, March 2020.

14. Jennifer Hame et al., "IDC MarketScape: Worldwide Artificial Intelligence Business Services 2021 Vendor Assessment," IDC, June 2021.

15. Paul McKay et al., "The Forrester Wave™: European Cybersecurity Consulting Providers, Q3 2021," Forrester, July 1, 2021.

16. Dan Bieler et al., "The Forrester Wave™: Innovation Consulting Services, Q2 2021," Forrester, June 22, 2021.

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