E2**OPEN**®

Blueprint for Managing Supply Chain Disruptions of Any Size

Performance During the COVID-19 Pandemic and AI's Role in Building Resilient Businesses

Executive Summary

Supply chains are all fundamentally designed to handle disruptions, routinely adapting to changing conditions. However, not every supply chain is resilient and agile enough to respond to major disruptions like those arising from the coronavirus pandemic. The impacts of COVID-19 caused many companies to initiate layoffs, liquidate assets and even file for bankruptcy protection. Others were able to use technology to quickly see and understand how their businesses were affected, take corrective actions and even grow — not just surviving but thriving.

The study outlined in this paper serves as a blueprint for how to prepare for future disruptions, whether they come from competition, technology, climate, pandemics, economic turmoil, trade wars or any other challenge. The data-driven insights and best practices included here can help organizations better respond to disruptive events of any size, mitigate business risks and capture unexpected growth opportunities along the way.

Artificial intelligence (AI) is key to gaining the necessary resiliency and agility to confidently address the unexpected. In fact, the data confirms that E2open's AI performed consistently and effectively at all stages of the pandemic encompassed by the study. Learning how AI and the use of real-time data mitigate extreme situations will better position leaders to reduce risks so their companies can avoid becoming a casualty of the next disruption — and emerge even stronger.

Three Stages of the Pandemic Defined by Service

Beginning in early 2020, the COVID-19 pandemic caused profound changes in the global economy. The stay-at-home orders instituted around the world changed consumer behavior and disrupted supply chains at an unprecedented scale. As corporate leaders confronted the crisis, some businesses experienced significant demand shocks as requests for goods or services all but evaporated in a matter of days or weeks. Others were more susceptible to supply shocks, with material shortages and reduced work shifts impacting production, protectionist trade policies restricting imports, and the lack of available transportation capacity delaying deliveries. Some businesses suffered both demand and supply shocks.

The companies in this study are global manufacturers that make essential goods: those that feed people, keep them healthy and provide quality of life. Consumer demand for these goods continued through each stage of the pandemic, although the demand varied for different categories. Variations were especially prevalent in the initial response to the pandemic when hoarding items like toilet paper, canned goods and sanitizer led to panic-buying and stockouts.

The study examines order, shipment and forecast data encompassing the North American operations of these global companies from January through August 2020. The purpose of the study is to quantitatively measure the supply chain impacts of the pandemic, assess the state of business for the "new normal" after the first-wave recovery and evaluate the role and usefulness of AI in the face of disruptions — even those of an unprecedented scale.

The COVID-19 pandemic triggered shocks in demand and supply, leading to unprecedented disruption across supply chains.

As COVID-19 spread across the world, some nations felt the impact sooner than others. In North America, order and shipment data from January through August 2020 reveals three distinct stages: a pre-pandemic period at the beginning of the year, an initial response in the spring and a first-wave recovery period through the summer (see Figure 1).
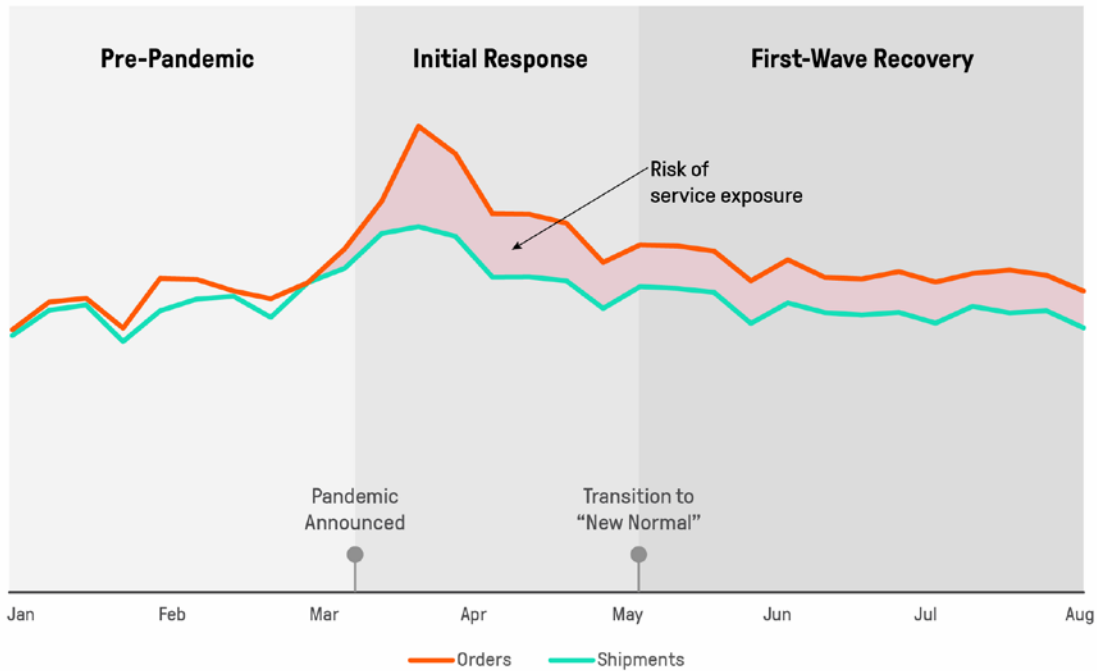

Figure 1: Pre-Pandemic, Initial Response and First-Wave Recovery Periods Based on Customer Service Data

Pre-Pandemic Period (January 1 to March 11)

Until March 11, early 2020 proceeded according to "business as usual" with supply chain performance following the general patterns of the preceding 12 months. The ratio of shipments compared to orders is a commonly used metric for customer service. In the pre-pandemic period, this metric reflected service levels that were within the range of industry norms.

Initial Response Period (March 11 to May 5)

In the United States, everything changed on March 11. Some of the many announcements that day included the World Health Organization officially classifying COVID-19 as a pandemic, coronavirus cases in the U.S. breaking the 1,000 mark as they rose 10-fold from the prior week and the American government announcing a ban on travel from Europe to prevent infections. Many companies, including E2open, instituted work-from-home policies that week. Not coincidentally, data from the study shows that March 11 also marked the beginning of widespread customer service issues. As the population prepared to hunker down at home, consumers started panic-buying goods. Demand spiked and inventory was quickly depleted. In some cases, multiple weeks' worth of sales came in as orders in a single week. Insufficient capacity for fulfilling these new orders resulted in rows of empty shelves.

The pink area in Figure 1 illustrates the new risk of service exposure during this period. Panic-buying in the second half of March caused a significant gap between orders and shipments, leading to stockouts and even rationing by retailers for certain items. On the average, service during the initial response period was 13% lower than pre-pandemic levels.

First-Wave Recovery Period (May 6 to August 1)

In early May, service levels stabilized to a new normal, marking the start of the first-wave recovery period. While better than the initial response, service during the first-wave recovery was 10% lower than pre-pandemic levels. In a European Central Bank panel discussion on November 12, 2020, U.S. Federal Reserve Chairman Jerome Powell said, "We're not going back to the same economy. We're recovering, but to a different economy." That is precisely what the data shows. In the summer, businesses entered a new normal, not pre-pandemic business as usual. The reduced service level suggests a higher state of risk and a more challenging business environment overall.

As part of the new normal, many companies in the study cut the number of items in production. This development differs from the standard trend of item proliferation and will become a topic for exploration in a future E2open Forecasting and Inventory Benchmark Study.

Increased Difficulty in Forecasting Demand During the Pandemic

Not surprisingly, the added volatility and shifts in consumer behavior during the initial response and recovery stages made it harder to predict demand. Data shows a sharp rise in weekly forecast error at the onset of the response phase. As panic-buying began, forecast error spiked to levels almost 45% higher than the pre-pandemic baseline. Forecast error then leveled out about halfway through the initial response phase to create a new normal that was nearly 30% higher than the pre-pandemic error levels (see Figure 2). In short, the effect of the pandemic was to make it 30% harder to forecast than it was the previous year.

This erosion of forecast accuracy is important to manage because literally every decision a business makes — from what to build, how much inventory to carry, how many factories to own or the size of every department's budget — is based on a prediction of what customers will buy. So getting it right is a business imperative. In board-level language, lower forecast accuracy makes it harder and more costly to delight customers, eroding the bottom-line, return on capital and shareholder value.

> Just like the economy, supply chains stabilized in the first-wave recovery, but it was no longer business as usual. The pandemic made it 30% harder to forecast demand compared to the previous year.
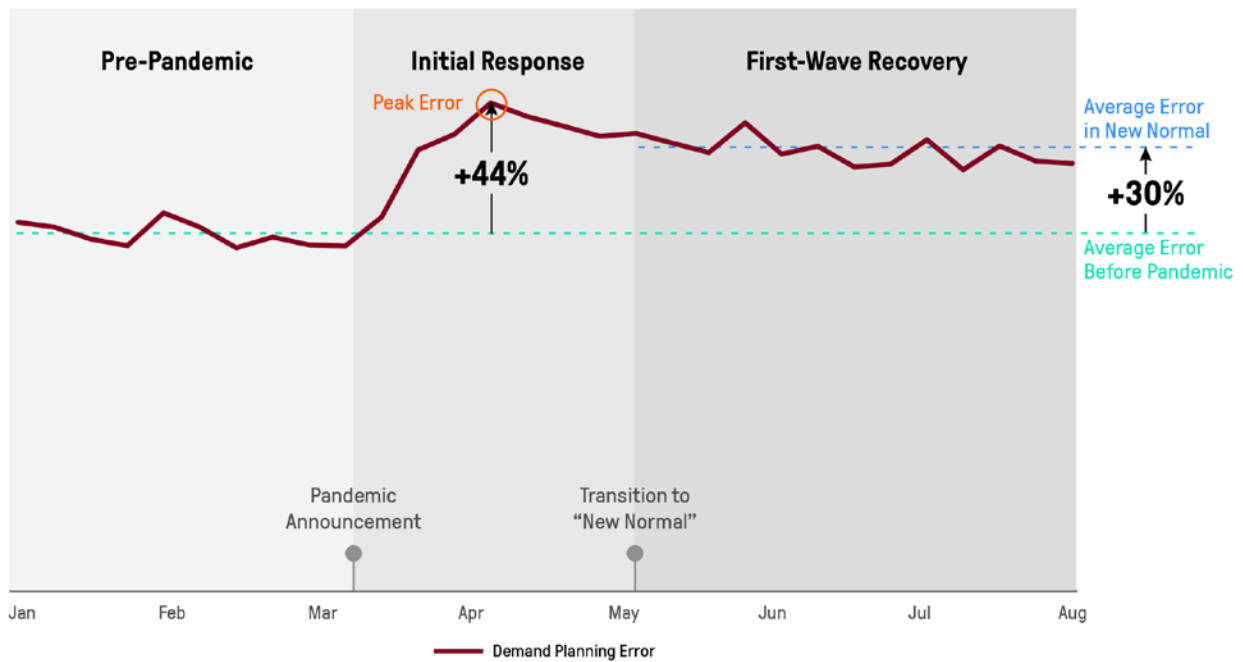
Figure 2: Forecast Error in the New Normal: 30% Higher Than the Pre-Pandemic Baseline

AI's Crucial Role in Managing Disruptions — Including Pandemics

For years, supply and distribution operations were relatively stable and cost-optimized. However, the speed at which the pandemic spread and the magnitude of its impact on global supply chains exposed systemic vulnerabilities. A new reality has emerged: What had been good enough for years is no longer good enough. Risk and resiliency are now top-of-mind with CEOs as they look to rebalance their supply chains to survive and thrive in the face of more frequent and more severe disruptions.

New Approach for Dealing With Disruptions of Any Size

To understand the impact of large disruptions and make the right business decisions, leaders need a new way of thinking that starts with real-time visibility across the entire supply chain. For a brand owner, this means visibility into every part of the physical supply chain — including all tiers of internal and external supply, manufacturing and distribution, as well as the logistics partners that move goods and materials at every stage. The resulting data is foundational to making the end-to-end business decisions required today and acting on them by orchestrating processes across all upstream and downstream parties. It is a core requirement for advanced supply chain management systems that see, understand, act and learn to make better decisions every time — no matter what disruptions occur.

The less accurate forecasts are, the harder and more costly it is to delight customers. This erodes the bottom line, return on capital and shareholder value.

Anyone running a supply chain today will recognize that the challenges of managing disruptions of any magnitude — including pandemic scale — cannot be solved by people alone. It takes automation and AI to gather all the necessary data, cleanse it, enrich it and make it decision-grade. AI is required to give data the context for creating a digital twin of the physical supply chain. AI also processes huge volumes of data and information to perform complex mathematical calculations in seconds, decide on the best course of action and automatically execute it. This is precisely the kind of AI that powers E2open's Demand Sensing application.

The AI in E2open Demand Sensing was purpose-built to use masses of real-time data to sense disruptions of any size, create a forecast that reflects current realities on the ground and automatically act on it without human review. The data comes from internal and external systems, including channel ecosystems such as retailer point-of-sale information, store inventory and warehouse withdrawals, causal data like weather, and even unstructured data such as social media.

What's needed is purpose-built AI that uses masses of real-time data from internal and external systems to sense disruptions of any size, create a forecast that reflects current realities and automatically act on it without human review.
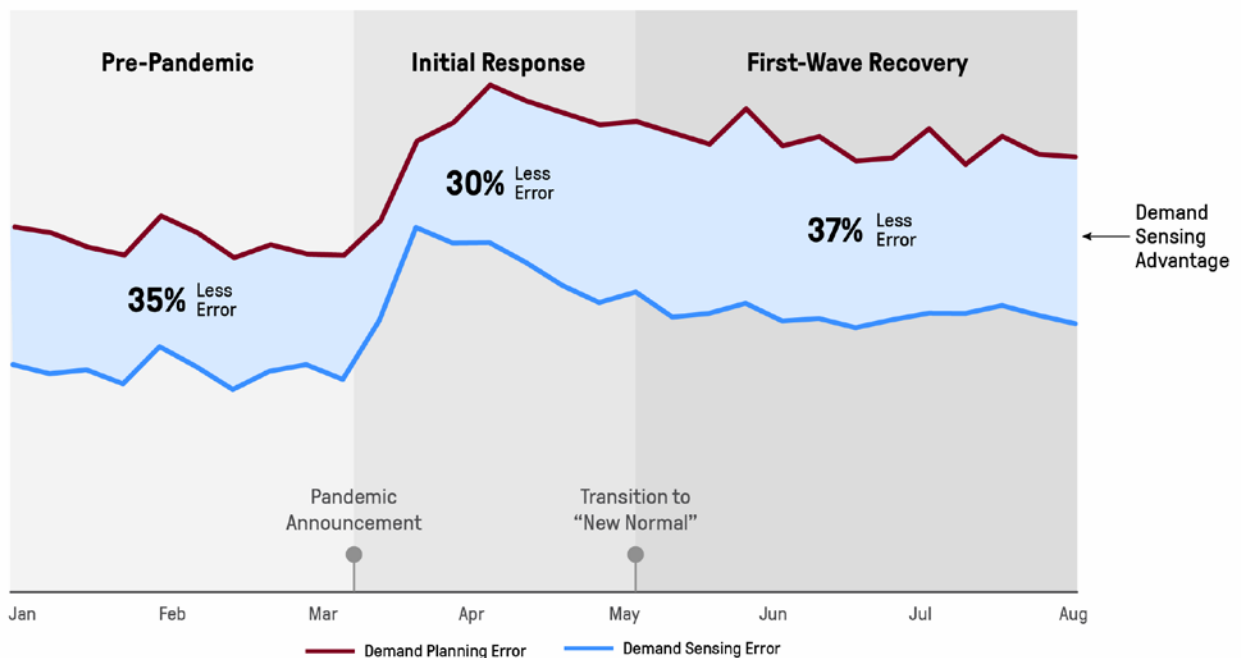

Figure 3: E2open Demand Sensing AI: Consistent Forecast Advantage Across All Stages of the Pandemic

Value of Robust Supply Chain AI

The million-dollar question is, "Can AI and real-time data deal with disruptions as large as the COVID-19 pandemic?" The initial response period constituted what was arguably the single largest change in consumer behavior in modern history, characterized by the sharp spike in forecast error that rose to 45% above the pre-pandemic baseline. The new normal in the first-wave recovery period was not much better, with forecast error still 30% above the baseline. At the time, many experts voiced concern that AI was ill-advised during the pandemic because it had to have previously observed this scale of disruption to provide value.

The fact is that not all AI is created equal. Unfortunately, marketing hype around AI clouds what vendors offer, often to the point where it can be hard to make the right technology investment decision. There are reports of vendors advising clients to turn off their AI out of concern that it could not handle the unprecedented swings posed by COVID-19. While that might be the right decision for vendors without years of field-proven technology, the study confirms that E2open's AI delivered a step change in performance advantage at all stages of the pandemic (see Figure 3). The AI in E2open Demand Sensing cut forecast error by an average of 30% during the initial response period and by 37% in the recovery period after the first wave.

Not all AI is created equal. E2open's field-proven AI provided a consistent performance advantage at all times before, during and after the most significant pandemic-related disruptions.

Supply chains are mission-critical. They call for robust, field-hardened AI, proven by years of production at scale. Anything less puts businesses at risk.
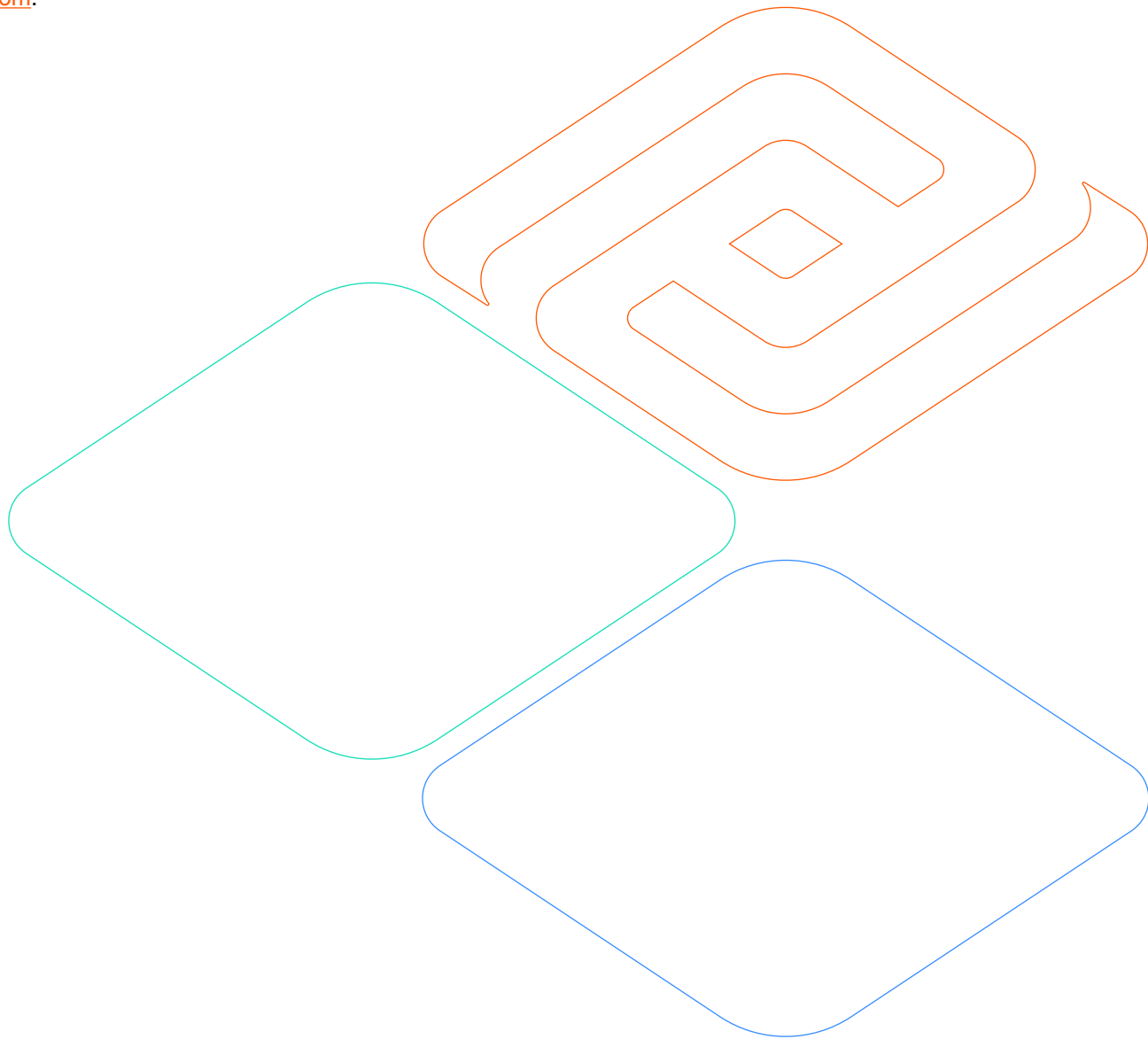
Key Takeaways

Every cloud has a silver lining, and the COVID-19 pandemic is no exception. While disruptions cannot be controlled, companies can shape the resulting impact on their businesses. The following four key learnings and best practices that emerged from the pandemic can help executives establish strategies for a steadier course going forward:

- **The pandemic has made supply chains harder to run.** With the first-wave recovery period, businesses settled into the new normal. However, today's new normal is markedly different than the pre-pandemic status quo, making it harder to accurately predict demand and use those predictions to delight customers. The old ways of doing things deemed good enough last year no longer work in this new environment and have become vulnerabilities.

- **The time to act is now.** Being prepared means making investments today to get ahead of the next major disruption. This positions companies to become more resilient, reduce risk and better equip themselves to capture the unexpected opportunities that spring from every challenge.

- **AI is a game changer.** The data in this study confirms that purpose-built AI combined with real-time data is the only way to get the performance advantage required to weather major disruptions — even unprecedentedly large ones. However, buyers should be wary in the selection process because AI must be field-proven with years of experience at scale to avoid putting mission-critical supply chains at risk.

- **Sometimes the best defense is a strong offense.** Rather than turning off supply chain AI in the face of large disruptions, it is better to accelerate its use and leverage more demand signals — especially external ecosystem partner data. The combination of AI technology, applications and real-time data is critical for enabling agility, efficiency and resiliency, both in the new normal and when managing future disruptions. This is like a new kind of insurance policy that mitigates downside risk while boosting day-to-day performance to get ahead and stay ahead of the pack — no matter what disruptions darken the horizon.

These four takeaways can help business leaders build more agile and resilient supply chains that have the ability to withstand disruptions of any size and emerge in a better position for success. To learn more about the insights in this study and understand how to prepare in advance for the next disruption, please contact E2open.

About E2open

At E2open, we're creating a more connected, intelligent supply chain. It starts with sensing and responding to real-time demand, supply and delivery constraints. Bringing together data from customers, distribution channels, suppliers, contract manufacturers and logistics partners, our collaborative and agile supply chain platform enables companies to use data in real time, with artificial intelligence and machine learning to drive smarter decisions. All this complex information is delivered in a single view that encompasses your demand, supply and logistics ecosystems. E2open is changing everything. *Demand. Supply. Delivered.* Visit www.e2open.com.

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