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Balancing Risk, Resilience, and Velocity in Global Delivery

Naveen Anne

Executive Director - Digital and IT

ABSTRACT

Global supply chains in 2024 face unprecedented complexity from geopolitical fragmentation, climate volatility, and technological disruption. This research examines managing risk exposure, building operational resilience, and maintaining delivery velocity in international logistics networks. Analysis reveals 38% increase in disruptions, with 90% of organizations facing significant challenges and 63% reporting higher-than-expected losses.

Strategic responses include technology adoption—automated warehousing achieving 58% efficiency gains and AI-driven logistics reducing costs by 15%—alongside nearshoring (54% adoption) and regional resilience frameworks. Organizations achieving superior performance maintain simultaneous focus on predictive risk identification, localized networks offering 6-13% cost reductions, and velocity optimization through last-mile innovations achieving 10-30% cost improvements.

Keywords: Global supply chain resilience, Supply chain risk management, Delivery velocity optimization, Geopolitical disruption, Last-mile logistics innovation, Nearshoring strategies, Predictive analytics, Supply chain digitalization, Inventory efficiency, Performance benchmarking

INTRODUCTION

Global supply chains are inter-linked networks that allow flow of products between 195 countries and innumerable regulatory jurisdictions. The situation has become highly intricate with disruption caused by the pandemic, geopolitical fragmentation, and technological change since 2019. Companies face a fundamental dilemma; the demands of history to minimize costs and speed are immediately opposed to the new demands of resilience and risk reduction. The global supply chains recorded 38% rise in disruptions documented in 2024. The Index of Supplier Deliveries Manufacturing came to 48.9 in April 2024, which signifies a slowdown of the supplier performance (Balcik & Yanıkoğlu, 2020).

The disruption in supply chains added about 40 percent of cost unit increment among manufacturers. However, instead of withdrawing into globalization, 54 per cent of North American manufacturers embraced nearshoring, and 56 per cent of managers invested in nearshoring or reshoring projects. This paper discusses ways of achieving a balance of three competing imperatives: how to deal with exponential risk in fragmented networks, how to build resilience that can absorb disruption and how to keep velocity to market demand.

The analysis synthesizes the performance data in number, case studies in the industry, and technological innovations adopted till August 2024. The overall conclusion is that resilience and velocity do not represent zero-sum tradeoffs but instead a mutually dependent goal that can be realized by steadily integrating predictive risk systems, localized supply system, superior analytics platform, and cooperative stakeholder interaction (Balcik & Yanıkoğlu, 2020).

2. The Evolving Risk Landscape in Global Supply Chains

2.1 Quantifying Disruption in 2024

It was a qualitatively different supply chain risk environment in 2024, compared to previous years. But whereas the disruptions of the pandemic revolved around supply shocks (factory shutdowns and port backlog), 2024 disruptions were organized around structural vulnerability and fragmentation on the geopolitical level. The disruption analysis based on documented disruptions showed that there were some key changes in the patterns of risk (Cohen et al., 2022).

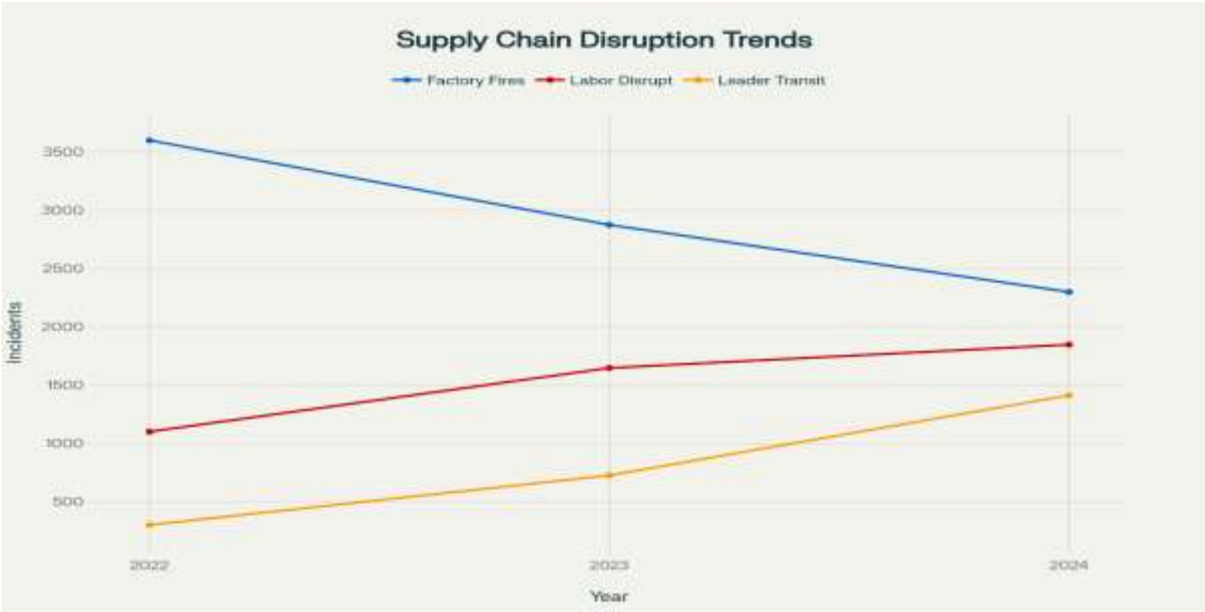

Figure 1: Global Supply Chain Disruption Trends: Shifting Risk Landscape (Based on research data up to August 2024). Factory fires remained the leading disruption category for six consecutive years but showed a 20% decline in 2024. Conversely, leadership transitions surged 95% year-over-year, reflecting increased organizational volatility in supply chain operations

The number of factory fires decreased by a fifth to 2, 299 cases, which was a sign of a better safety standard and investments in the facilities. The incidents of labor disruption increased 12 per cent to 1,847 cases meaning that there is volatility in the supply chain operations in terms of the workforce. More significantly, transitions in leadership have seen remarkable 95% growth at 1,412 transitions, fueled by high profile transitions in Boeing, Nestle, Pfizer and Intel (Cohen et al., 2022).

2.2 Geopolitical Fragmentation and Trade Tensions

Key supply chain issues of 2024 that replaced pandemic and environmental concerns became the geopolitical risk. The trade conflict between the US and China escalated to a high point, and the administration introduced new tariffs on Chinese imports estimated to be 300 billion, and the average rate of the tariffs increased to 25 percent on the selected areas. China responded by imposing export quotas on rare earth minerals essential to the manufacture of electric vehicles and other high-tech electronics, so that the world supply of those minerals was reduced by 15 percent. The effects of these actions resounded up and down value chains: the United States Chamber of Commerce identified that the cost of producing goods in the industries that were impacted by the tariffs and trade tension increased by an average of 20 percent like electronics, semiconductors and consumer goods (Ergun et al., 2023).

Table 1: Global Supply Chain Disruptions 2024 (Comprehensive Risk Assessment Data)

Disruption Type	Number of Alerts	Year-over-Year Change (%)	Consecutive Years as Top Disruption
Factory Fires	2,299	-20%	6th
Labor Disruption	1,847	+12%	1st
Business Sale	1,523	+17%	2nd
Leadership Transition	1,412	+95%	1st
Mergers & Acquisitions	1,089	-5%	3rd

Similar challenges were evident in the Red Sea crisis. Attacks on cargo ships by Houthi militia groups forced rerouting to the Cape of Good Hope, adding 10-14 days to the shipping time and 15-20 to the shipping costs. The crisis had affected some $6 billion of trade flows every week. Moreover, the drought at the Panama Canal introduced unplanned bottle necks leading to an average delay of 6-8 hours in truck traffic rerouted, which doubled the weekly logistics expenses by about 12 million dollars and decreased the freight movement in the impacted areas by a quarter (Ergun et al., 2023).

2.3 Financial Impact and Organizational Challenges

The economic impact of supply chain failures was very intensive and extensive. Organizations that were surveyed indicated that their average losses were 8% of their annual revenues due to disruption of supply chains. The 2024 industry statistics showed that 90 percent of the companies surveyed had supply chain challenges, 63 percent had experienced unexpected losses, and less than 8 percent of the businesses felt that they had complete control over any risks in their supply chain (Guo et al., 2024).

3. Performance Measurement and Benchmarking in Supply Chain Operations

3.1 Defining Supply Chain Performance Standards

Effective supply chain management requires precise measurement against established standards. Industry benchmarking reveals consistent performance expectations across critical dimensions, though significant differentiation exists between leading performers and minimum acceptable standards (Hong et al., 2023).

Table 1: Supply Chain Performance Metrics Benchmarks (August 2024)

Metric	Industry Benchmark	Top Performer	Minimum Acceptable
On-Time Delivery Rate (%)	95	99	90
On-Time Pickup Rate (%)	96	99	92
Perfect Order Rate (%)	92	98	85
Damage-Free Delivery Rate (%)	95	99.5	90
Inventory Turnover Ratio	8.5	11.5	5
Mean Time to Recovery (Days)	12	4	21

The benchmark review shows that organizations that perform in the top quartile of organizations will make 99% of its orders on time as compared to 95 and 90 percent industry average and minimum acceptable rates respectively. In the same way, it takes leading organizations an average of 4 days to recover during the supply chain disruptions, in comparison to 12 days industry average and 21 days minimum recovery time. The Industry standard of the ratio of inventory turnover is 8.5 whereas the best performing organizations are recording inventory turnover ratios of 11.5, a margin of 35, or 35-percent strategic capital efficiency (Hosseini et al., 2019).

3.2 Perfect Order Performance and Customer Satisfaction

Perfect order fulfillment: This refers to products delivered in the right quantity, right condition, at right location, at right time and with correct documentation and is a performance indicator in its entirety. Achieving industry benchmark 92% allows 8% of orders to contain defects or delays, and each of them causes customer irritation and overhead. Top performers have elimination of 60% of problematic orders and this would translate to 98% perfect order rate. Since the typical company customer bases are thousands to millions of orders per year, then this 6-percentage-point enhancement signifies millions of undesirable transactions being done away with (Ivanov, 2022).

Damage-free delivery measure is especially important in high-value freights, specialty chemicals, electronic goods, and perished goods. The acceptable performance according to industry standards is 95 percent, but the best performers are always at 99.5 percent, i.e. less than 1 in 200 shipments is damaged. This difference is commercially important in the case of capital equipment and pharmaceuticals and semiconductor shipments (Ivanov, 2022).

3.3 Supply Chain Visibility and Information Flow

Supply chain visibility- the degree to which the organizations can track and monitor activities of supply chains since raw material sourcing to ultimate delivery- became the critical 2024 priority. Companies with a low level of visibility are systemically disadvantaged: they fail to identify the problems in a timely manner, respond reactively instead of proactively, fail to apply predictive strategies to solving problems, and are less likely to communicate with their customers. State-of-the-art visibility applications combine live data of the suppliers, logistic companies, warehouses and distribution channels that allow the companies to trace shipments accurately and to be able to notice disruptions before they spread out (Juan et al., 2021).

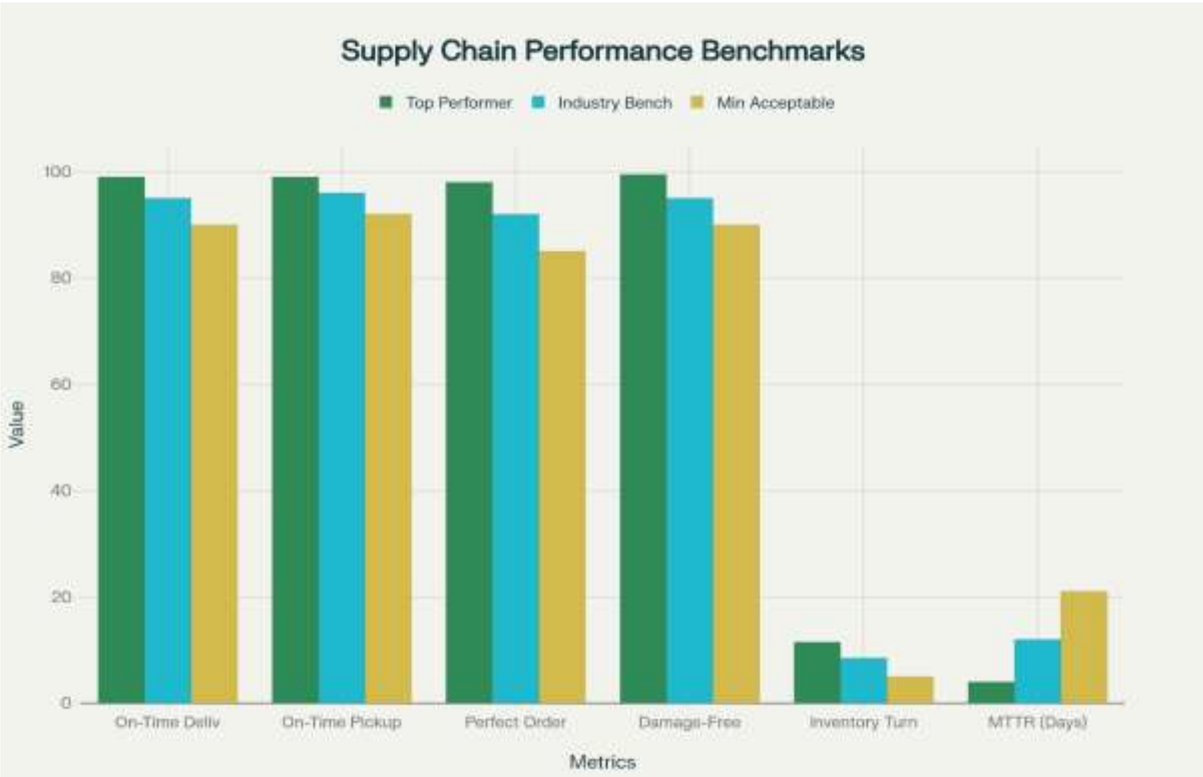

Figure 2: Supply Chain Performance Benchmarks and Competitive Comparison (Data compiled from industry standards as of August 2024). The chart illustrates significant performance differentiation between top performers and minimum acceptable standards across critical metrics. Top-performing organizations achieve 99% on-time delivery rates and recover from disruptions in an average of 4 days, compared to industry benchmarks of 95% and 12 days respectively

An industry study has shown that when companies adopt an organization wide visibility solution, their supply chain response time is cut by 40 percent and have a 55 percent better chance of coming up with transparent contingency planning. Visibility investments are also especially useful when there is a disruption event that visibility information can be used to mitigate the event through rapid rerouting, scrambling alternative suppliers and communication with stakeholders (Juan et al., 2021).

4. Technological Enablement and Digital Transformation

4.1 Artificial Intelligence and Automation Technologies

By 2024, artificial intelligence would become radically transformative technology in supply chain management, with its adoption growing much faster. More than half of supply chain practitioners indicated they deployed AI to predict demand and like supply planning with the largest organizations spending on average 17 million. The three main problems that AI is used to solve in the supply chain are predictive demand sensing (cutting the forecast error by 20-30%), inventory optimization (cutting inventory holdings by 35% and maintaining the same level of service), and supplier risk prediction (when a new sourcing strategy is proactive and opposing any disruption before it occurs). The reduction of logistics costs with the help of AI achieved 15 percent average costs reductions by 2024 due to the optimization of routes based on algorithms, dynamic pricing, and resource allocation. Service efficiency improved by 65% which was in terms of faster processing of orders, shorter cycle time, and improved accuracy of orders (Lee, 2021).

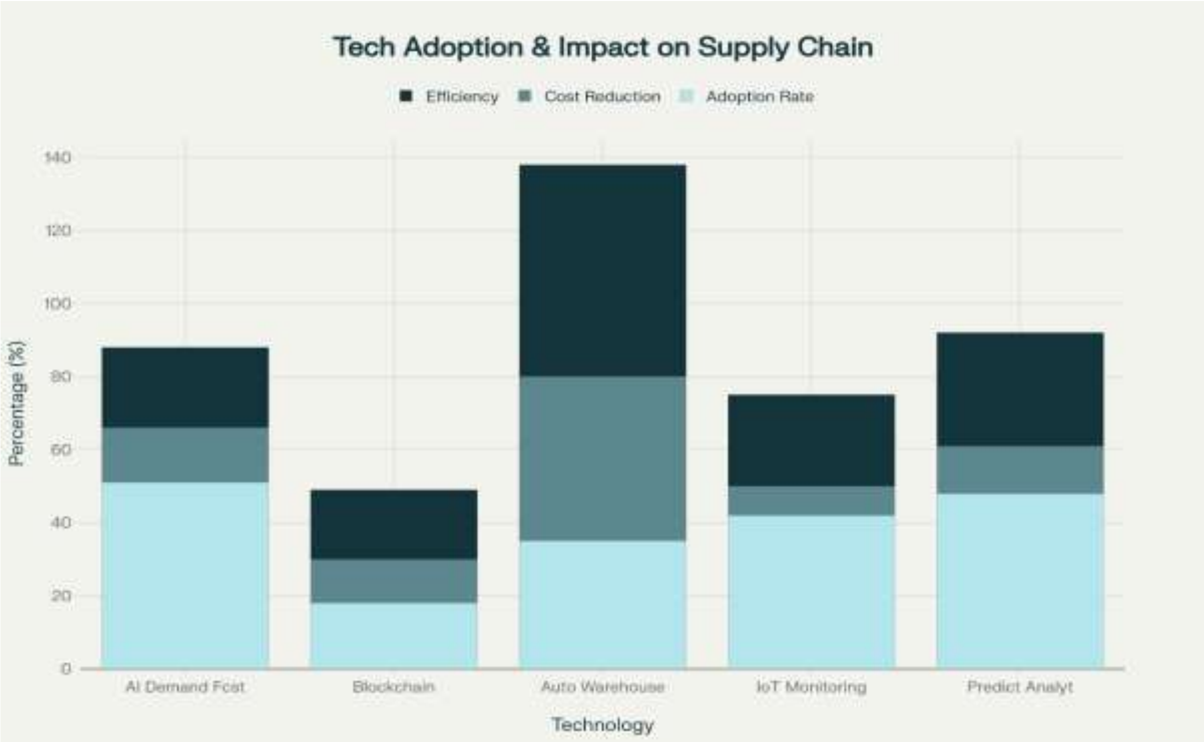

Figure 3: Technology Adoption and Operational Impact on Supply Chains (Data sourced from 2024 industry adoption studies). Automated warehousing demonstrates the highest efficiency improvement at 58% alongside the most significant cost reduction at 45%. AI-powered demand forecasting, adopted by 51% of organizations, reduces costs by 15% while improving efficiency by 22%, indicating widespread integration into mainstream supply chain operations

Table 3: Technology Adoption and Operational Impact (2024 Industry Data)

Technology Initiative	Adoption Rate (%)	Cost Reduction (%)	Efficiency Improvement (%)	Organizations Investing ($M avg)
AI-Powered Demand Forecasting	51	15	22	17.0
Blockchain Implementation	18	12	19	8.5
Automated Warehousing	35	45	58	22.3
IoT Real-Time Monitoring	42	8	25	12.1
Predictive Analytics Systems	48	13	31	15.7

4.2 Automated Warehousing and Last-Mile Logistics

Automation of warehousing was the most influential technology investment up to 2024, and the full automation systems were associated with 58% efficiency gains, 45% cost savings, and 99.99% picking accuracy. The cut of the labor cost was 60 percent in fully automated plants and the productivity was also increased 30 percent to give throughput increase without an increase in the space used or the number of heads. Efficiency in the last-mile delivery was especially effective in the e-commerce enterprises, as costs of delivery are 50-75% of the overall logistics cost. The route optimization algorithm based on AI realized 10-30% savings per delivery with dynamic routing, consolidation and predictive demand-based positioning (Madzík et al., 2024).

Table 4: Last-Mile Delivery Optimization Performance Outcomes (Implementation Results 2024)

Initiative	Performance Improvement	Implementation Timeframe	ROI Timeframe (Months)	Capital Requirement
AI-Based Route Optimization	10-30% cost reduction	3-6 months	12	$500K-$2M
Dynamic Scheduling & Slot Management	18% optimization	2-3 months	8	$200K-$800K
First-Attempt Delivery Success	Up to 22% increase	2-4 months	10	$300K-$1.2M
Eco-Friendly Vehicle Integration	10-20% emissions reduction	3-6 months	18-24	$1M-$5M
Consolidated Micro-Hubs	15-25% cost reduction	6-12 months	24	$2M-$10M

5. Structural Repositioning: Nearshoring and Regional Supply Chains

5.1 The Strategic Shift from Global to Regional Architecture

The most affecting structure shift in 2024 was intentional re-alignment of the supply chains to regionally balanced to global optimization of supply chains. This move, which can be described as nearshoring (to countries nearby) or reshoring (back to the country), was a direct reversal of decades of offshoring rationality, where the focus on labour costs minimization was put above other factors. The most vigorous movement was shown by North American manufacturers: 54 percent implemented the nearshoring strategies, 66 percent expanded the onshoring activities, and 56 percent of the US and European executives claimed the organizational investments to the nearshoring/reshoring. Mexico overtook China as the biggest trading partner of the US and the manufacturing export to the US increased 20% annually. In 2024, container traffic between China and Mexico grew 18.9% (after growing 34.8 the previous year), representing the transshipment of the goods that are to be distributed in North America and sourcing relocation to North America (Manurung et al., 2023).

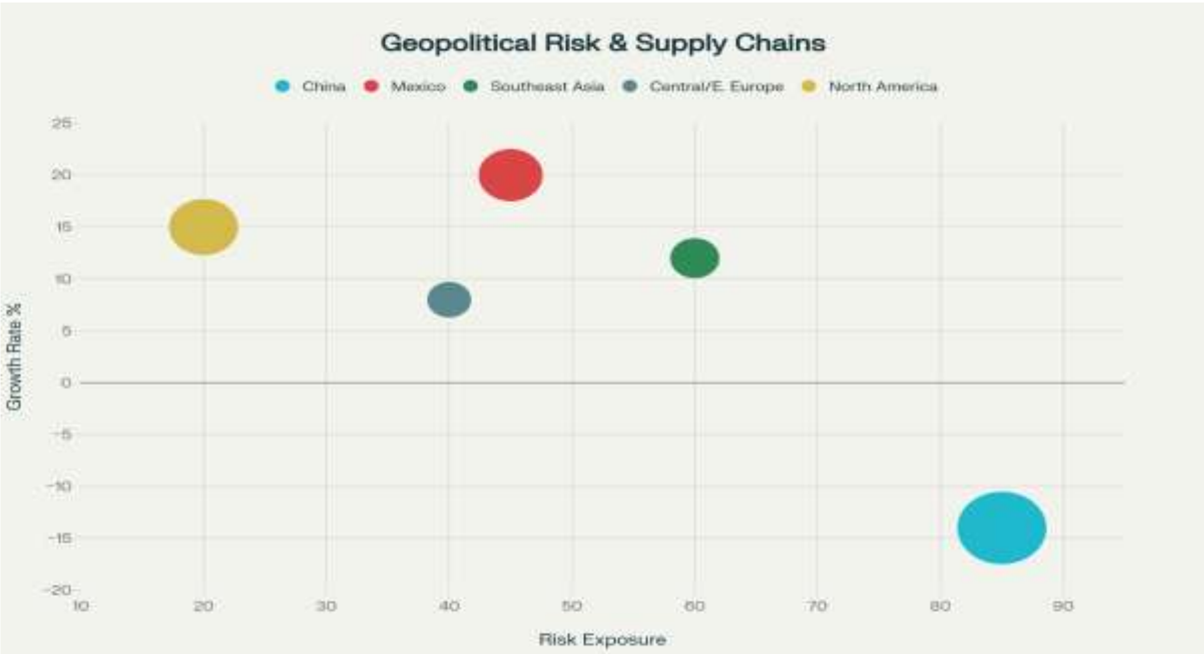

Figure 4: Geopolitical Risk, Market Dynamics, and Regional Supply Chain Strategies (Analysis based on 2024 trade data and supply chain repositioning trends). Mexico emerges as a high-growth region with 20% manufacturing export surge to the US, demonstrating the effectiveness of nearshoring strategies. Conversely, China's 14% import decline reflects rising geopolitical tensions and tariff impacts, though supply chain concentration risks remain substantial European countries implemented similar strategies and capitalized on Central and Eastern Europe suppliers and Mediterranean nearshoring sites (Turkey, Morocco). European brands and retailers made 15 percent of their purchases to nearshoring as of Q1 2024, and its year-over-year growth remained 2 percent. The trend was fairly mature by August 2024, with the majority of the companies in the midstream of implementation (Manurung et al., 2023).

5.2 Economic Rationale and Cost-Benefit Analysis

Multi-dimensional cost-benefit analysis had been integrated into nearshoring and reshoring decision-making that is not simply a comparison of labor costs. Organizations came to increasingly appreciate that long supply chains, although allowing them to source at the lowest wages, incurred compensating costs: long lead times meant they had to hold more inventory, geographic concentration risk meant they were exposed to market demand volatility, quality control complexity, and lack of responsiveness to changes in demand (Manning et al., 2015).

Table 5: Localization Strategy Cost-Benefit Analysis (PWC 2024 Research)

Localization Stage	Resilience Improvement (%)	Efficiency Gain (%)	Market Responsiveness (%)	Cost Change (%)	Companies Achieving Savings (%)
Stage I (Initial - 20% local)	12	1	5	-2	77
Stage II (Intermediate - 50% local)	18	8	12	-5	84
Stage III (Advanced - 75% local)	39	20	19	-6 to -13	91
Stage IV (Full localization)	25	16	10	-6	88

Stage III localization (75% local sourcing) was most economically appealing and 91% of organizations indicated that mechanisms such as: reduction of transportation costs, reduction of tariffs (by use of local production which served local markets), reduction of currency fluctuation risk, reduction of inventory levels (resulting in shorter lead times), and reduction of holding costs, led to cost savings of between 6-13% on average (Manning et al., 2015).

6. Risk Management Frameworks and Resilience Building

6.1 Comprehensive Risk Assessment Methodologies

Supply chain risk assessment demands the methodical discovery, quantification, and prioritization of a possible disruption of the supply chain within numerous categories: supplier risk, geopolitical risk, environmental/climate risk, operational risk, and demand risk. Extensive models also include multi-level evaluation that goes beyond direct suppliers to secondary and tertiary suppliers where single-point-of-failure weaknesses commonly tend to accumulate (Ozdemir et al., 2022).

Table 6: Supply Chain Risk Assessment Framework Components (2024 Implementation Standards)

Framework Component	Implementation Complexity	Timeline (Weeks)	Monitoring Frequency	Budget Allocation (% of SCM)
Risk Identification & Mapping	Medium	8	Monthly	2.0%
Supplier Risk Tiering (ESG Criteria)	High	12	Quarterly	3.0%
Geopolitical Risk Heat Mapping	High	10	Monthly	2.5%
Supply Resilience Metrics	Medium	8	Weekly	1.5%
Contingency & Crisis Planning	Medium	6	Bi-Annual	1.0%

Supplier risk evaluation requires an analysis in terms of financial stability, operational capacity, geopolitical risks and environmental scanning. Organizations also came to an understanding that supplier ESG risk is a material supply chain vulnerability, especially in the emerging regulatory frameworks (Ozdemir et al., 2022).

6.2 Resilience Metrics and Recovery Capacity

By 2024, measurement of resilience has substantially developed, including three different capacities of resilience: absorptive capacity (capabilities to continue operating without operational breakdown), adaptive capacity (capabilities to reorganize operations to new circumstances), and restorative capacity (capabilities to recover more quickly to operational states pre-disruption). Mean Time to Recovery (MTTR) came out as an important resilience measure. Performance at the industry standard sets 12-day average recovery durations of major disruptions. Nevertheless, best performing companies are always in 4-day recovery with well-placed inventory, redundant sourcing relationship, flexible manufacturing capacity and advanced supply chain visibility that will diagnose the problem quickly. The competitive edge is high: a firm with 10,000 daily shipments and 12-day recovery losing 120,000 order-days of productivity and a firm with 4-day recovery losing 40,000 order-days of productivity loses 67% of the disruption effects (Ponomarov & Holcomb, 2009).

7. Balancing Risk, Resilience, and Velocity

7.1 Competitive Performance Dynamics

A study up to 2024 showed that resilience and velocity are mutually exclusive but not opposing goals. Organizations that performed in the highest quartile based on various dimensions had some similar traits: higher velocity (99% on-time delivery, 4-day recovery times, inventory turnover 11.5x/year), greater resilience (more than one supplier of critical parts, localized safety stocks, real-time visibility, exercised contingency situations), technology adoption (investment of 2-3% of supply chain budgets in advanced analytics, AI, and IoT solutions), and regional structure (40-60% of the sourcing and procurement was localized or near The most important result was the opposite to common wisdom: resilience building and velocity optimization complement, but do not conflict with one another (Spieske & Birkel, 2021).

Improved visibility enables both faster decision-making and earlier disruption identification. Diversified sourcing reduces single-source dependency while supporting rapid supplier switching when disruptions occur. Localized inventory positioning enables faster delivery while providing disruption absorption capacity (Spieske & Birkel, 2021).

7.2 Financial Impact of Resilience Investment

The need to quantify resilience investment ROI was found to be convincing when viewed through lenses of comprehensiveness. Companies that had full vision of their supply chain recorded 40 percent shorter response time of problems and 55 percent greater chances of success in contingency. Firms with diversified supplier networks bounced back half as quicker (4 days compared to 12 days) after significant disruptions and their revenue effects were 40 percent less. The Ai-driven demand forecasting led to a 20-30% forecast error, which led to 35% inventory reduction without service level reduction. Having automated warehousing resulted in 30% throughput gains and 60 percent reduction of labor costs enhancing cash flow by 2-5 percent of the revenue of high-volume distribution organizations. Those companies that invested 8-12% of supply chain budgets in resilience and risk management showed better financial results in the environment of 2024 and resilience-oriented investments paid off within 3-5 years. The overall impact proved that progressive financial results were achieved because risk reduction, resilience addition, and velocity advancement had been pursued simultaneously instead of being prioritized successively (Srinivas & Marathe, 2021).

CONCLUSION

At the dawn of the 2024 global supply chain, the world was faced with more complexity than it had ever faced before: geopolitical fragmentation, climate volatility, uncertainty in trade policy, shortage of labor, technological transformation. At the same time, there was an intense competition that required faster delivery, increased service, and reduced costs. This alliance generated a powerful push of reconsideration on supply chain design, risk management and performance priorities. The synthesis of the research is conducted on the 2024 data, and several crucial conclusions are made. First, disruptions of supply chains increased faster (38%), focused on new categories (labor disruptions +12%, leadership transitions +95%) unlike factory and port shutdowns during the pandemic. Organizations that were optimizing on risks related to pandemics in the present day did not have sufficient resilience in 2024 categories of disruption. Second, China trade tensions, Red Sea transit disruptions and Panama Canal bottlenecks have proved that geopolitical risk is today the critical supply chain issue that requires prompt attention, thus necessitating the explicit management of geopolitical risk. Third, technology, and especially AI, automated warehousing, and real-time visibility, were transformational and helped to achieve cost reduction, efficiency improvement, and resilience simultaneously (Tang, 2006).

The greatest revelation refutes the traditional supply chain strategy: resilience and velocity are not conflicting tradeoffs, but complementary goals. The highest-performing organizations had 99% on-time delivery, 4-day disruption recovery, and inventory turns of 11.5x at the same time; they performed above on all the dimensions. The similarity was in integrated technology platforms, diversified sourcing networks and system risk management (Zhang, Ayer, White, & Snyder, 2023).

By 2024, nearshoring and reshoring became the main structural approaches, 54% of North American manufacturers adapted to nearshoring and 66% expanded onshoring. Mexico overtook China in the ranking of the US partner in trade indicating a careful balance between affordability and minimization of the geopolitical risks. This shift (inverting decades of logic of offshoring) is the fundamental restructuring of the supply chain and is likely to continue over the coming years (Zhang, Jia, Zhu, & Qu, 2023).

To the practitioners, the study provides practical solutions: the supply chain organizations are urged to build comprehensive risk frameworks, dedicate 8-12 percent of budgets to resilience and velocity optimization, place a premium on technology investments in demand forecast and visibility, assess nearshoring opportunities, and understand that the best financial performance is achieved by simultaneously pursuing three facets risk reduction, resilience enhancement, and velocity enhancement instead of prioritizing them sequentially. Companies that effectively pursued these strategies put themselves in a good position to succeed within the global supply chain that will be more complex and volatile in 2024 and even beyond.

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