Confederation of Indian Industry

CII Institute of Logistics

Strengthening Supply Chain Resilience

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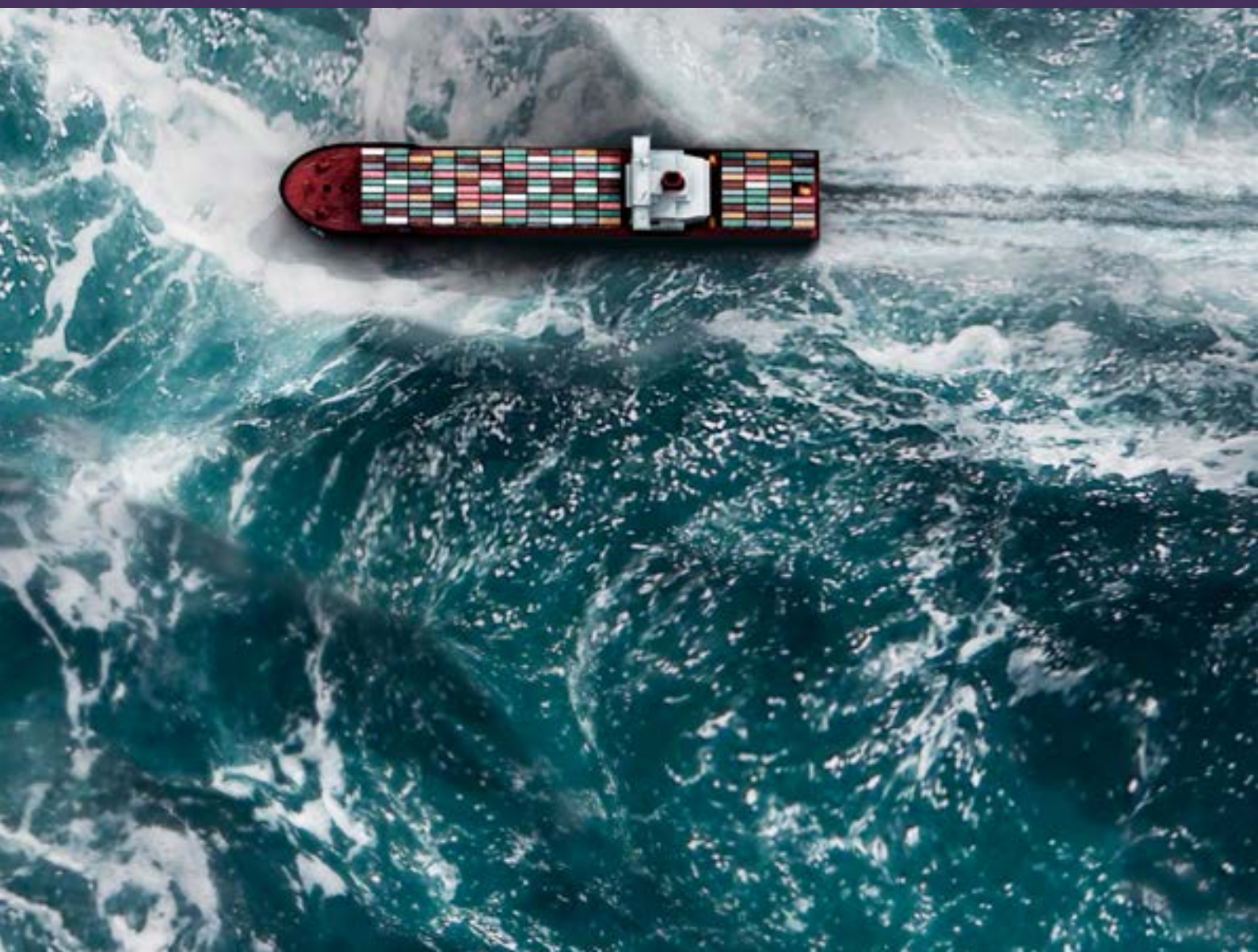

Preface

We at CII Institute of logistics, a renowned center of excellence in logistics and supply chain management are delighted to share this report on Strengthening Supply Chain Resilience, which provides a thorough examination of the pivotal strategies necessary for building resilient supply chains.

In an increasingly interconnected and unpredictable global economy, the resilience of supply chains has never been more critical. This report is structured to make supply chains capable of withstanding and adapting to global disruptions. Drawing on real-world examples and the latest advancements in supply chain management, the report outlines actionable insights for organizations striving to protect their operations and ensure continuity in times of crisis.

We invite you to read this report to equip yourself with the knowledge needed to foster supply chains that not only endure but excel in an unpredictable world.

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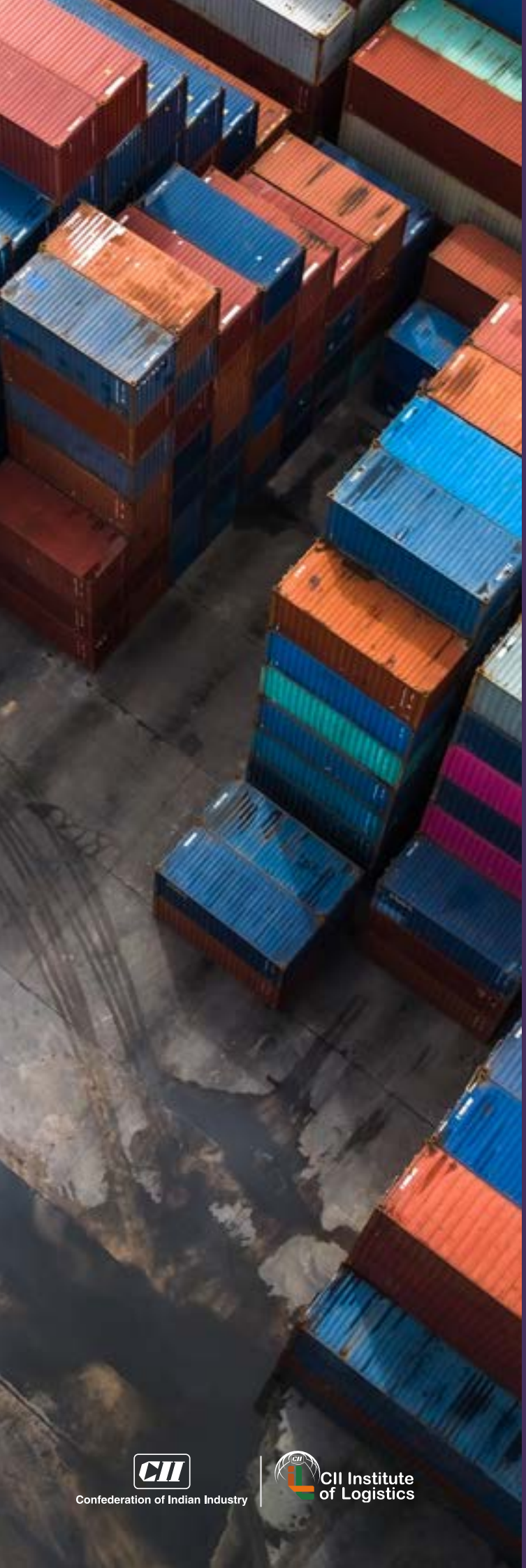

Supply chain risk manifests at the intersection of vulnerability and exposure to unforeseen events. More often than not, organizations are unaware of the type, extent, and probability of various supply chain risks. Resilient supply chains can protect organizations by significant margins during times of crises. For example, when a tsunami hit Japan in 2011, the operations of a multinational automotive **manufacturer were shut down for nearly two months** after a magnitude-9 earthquake hit facilities. Production in the United States declined by 30 percent due to a shortage of parts produced. To become more resilient, the company used a combination of tactics, notably the construction of a comprehensive database of thousands of its suppliers and the hundreds of thousands of parts to quickly identify how to shift components across sites when needed, so that disruptions at one location would not affect global operations. When earthquakes again struck Japan in 2016 and 2019, the firm kept production stoppages to **two weeks or less and avoided disruptions** in its worldwide operations.

Comprehensive management of supply chain risk not only helps organizations minimize the impact of disruptions (whenever they arise), but also realize lasting impact to core business operations.[1]

Reduced material/manufacturing costs– As organizations simplify product complexity and make procurement and manufacturing innovations (e.g., flexible manufacturing), they can expect to reduce material costs by 3–5% and manufacturing costs by 2–3%.

Reduced distribution costs–Adoption of dynamic optimization techniques for fulfillment channels (transport mode and routes) and other strategic levers can help reduce distribution costs by 3–5%.

Increase in topline–Use of advanced planning methods (e.g., demand sensing/shaping, margin-based SKU rationalization) can reduce supply-demand mismatch and optimize sales, facilitating up to 4–8% improvement in topline.

One-time cash release–Implementation of resilience levers which focus on simplification can inadvertently lead to release of ~10–25% of locked capital. Few examples of these levers are product simplification, inventory optimization, etc.

[1] All improvement levers detailed ahead

Addressing resilience in global supply chains

Organizations can leverage an amalgamation of best-in-class strategies (customized to their context/ design gaps) to achieve resiliency in supply chains (Exhibit 1).

Exhibit 1

Companies need to "play offensive" across the strategic levers to achieve best-in-class resilient and transparent supply chains

Resilience lever Transparency lever

Lever	Playing defence	Playing offence
S&OP process	Supply-forward view to monthly S&OP.	Integrated margin-back view to daily planning.
Increasing agility	Robust processes of demand forecasting, supply planning and monthly plant scheduling.	Autonomous planning with minimal manual interventions, Digital twin of supply chain networks for simulation and monitoring.
Network design	Static network with hubs and spokes created once every 2 to 3 years.	A dynamic network with E2E digital visibility, that rewires based on real-time triggers such as fuel inflation trade-offs (e.g., road vs rail) and shipping costs (e.g., container availability in routes).
Sourcing program	Legacy supplier networks with periodic re-shuffle. Visibility limited to tier-1 suppliers.	Flexible/multi-source material sourcing, Geo-redundancy and selective regionalization, N-tier supplier visibility. Advanced vendor management and supplier analytics.
Inventory management	Just-in-time inventory norms with static buffers.	'Just-in-case' dynamic safety stocks based on external shocks (e.g., Inflation, lockdowns).
Last mile network	Single mode and single channel to serve different customers.	Omni-channel network leveraging different players in the eco-system.
Demand forecasting	Forecasting based on statistical models on historical sales.	Demand-sensing from external triggers. Demand-shaping.
Operating model	Strong teams collaborating within the supply chain (e.g., planning, logistics, etc.).	Supply chain nerve center (Predictive and Prescriptive control tower) as the single source of truth and decision making.
SKU complexity	Production lines optimized to produce multiple SKUs sequentially.	Supply chain optimized with 'delayed differentiation' to reduce manufacturing complexities.
Organization	In-house team of domain experts in supply chain.	Leveraging an eco-system of start-ups (e.g., for route optimization), Center of Excellence (COE) and internal experts, for risk prevention and monitoring.
Aspirational KPI setting	**Cost:** Reduce by 3–5% **OTIF[1]:** Improve by 5–10% **Inventory:** Reduce by 10%	**Cost:** Reduce by 8–10% **OTIF:** Improve by 10–20% **Inventory:** Reduce by 20–30%

1. OTIF = On Time In Full

1. Improved S&OP process

An integrated sales and operations planning (S&OP) cockpit can help S&OP planners make faster decisions based on revenue/margins and trade-offs on inventory/costs, instead of being solely guided by supply situations. Such S&OP can only be realized through a more flexible supply chain and by mining real-time datasets (across supply, operations, and demand), as described ahead. One example of such planning is daily re-routing of produced material basis demand hotspots, instead of using static monthly plans.

A fast data-driven exception-handling process can help companies meet unexpected changes in demand.In one case, a company improved service levels through data-driven, proactive identification and mitigation of short-term risks arising from demand-supply gaps for customer orders, and now expects 10–15% improvement in OTIF levels.

2. Increasing supply chain agility

One of the cornerstones of increasing supply chain agility is to enable E2E network visibility, and build autonomous planning systems (Exhibit 2) on top of the network data. Best-in-class supply chain control towers utilize rule-based, ongoing, machine-supported decision making, with planners intervening only to manage exceptions.

Availability of rich historical data can also allow use of dynamic optimization and advanced analytics methods, such as digital twins. Digital twins are virtual representations that can closely replicate the performance of real-world supply chain assets, which helps in running quick, accurate simulations and perform predictive maintenance.

A Belgium-based multinational drink and brewing company uses supply chain digital twins to enable brewers to adjust inputs based on real-time conditions and automatically compensate for production bottlenecks when, for example, vats are full. It also gives the company's production engineers remote assistance and Augmented Reality (AR) capabilities for live troubleshooting on how to fix pump leaks and other common issues.

3. Advanced sourcing programs

Supply resilience can be achieved by focusing on levers like flexible material sourcing (incl. geographical-redundancy), N-tier supplier visibility, and advanced vendor management.

Flexible sourcing is enabled by operational strategies like spot procurement and multi-sourcing, use of flexible supplier contracts (e.g., no-penalty agreements) and standard playbooks for tackling sudden changes in material availabilities/ timelines/ prices. Structural strategies focus on striking a balance between near-shoring of suppliers (based on cost, proximity to consumers) and diversification of supplier network (based on desired resilience level).

N-tier supplier visibility and advanced vendor management look at continuous supplier risk monitoring and set processes for rapid re-negotiations and Request for Proposal (RFP), to avoid operational/ reputational disruptions (e.g., backlash against use of suppliers involved in unethical practices).

During the 2017 Hurricane Maria, a US-based multinational biotechnology firm anticipated the shock and flexed sourcing by securing alternative procurement sources in advance, executing a $1.3 million purchase for items at risk of shortages. It also created a "war room" to identify supply chain threats and critical sub-tier suppliers. Coupled with few more initiatives, the firm weathered the storm better than competitors, and its stock price recovered and surpassed the pre-storm list price within 15 days of the landfall.

4. Better inventory management

Absence of safety stock of critical inventory can seriously threaten supply chain during times of crises. To achieve resilience and transparency in inventory, companies can work to identify critical suppliers, prioritize them by importance-vulnerability and take mitigation steps (e.g., finding alternate suppliers, redesigning networks, keeping safety stocks, sourcing locally or regionally etc.). Use of historical information and data modelling methods can also help forecast disruption scenarios and determine optimum level of safety stocks to minimize impact.

Exhibit 2

Autonomous planning differs from traditional supply chain planning in several ways

Features of autonomous planning

	From	To
Efficient	Many manual steps and interventions.	Automation of inputs to demand and supply planning; streamlined order management; exceptions elevated.
Powered by advanced analytics	ERP[1] and standard software functionality; software potential largely unrealized.	Advanced analytics with artificial intelligence and machine learning in forecasting; multi-echelon, continuous supply-planning optimization.
Fast	Monthly, weekly, and daily cadence (e.g., for S&OP planning, S&OP execution, IBP[2]); lots of data review and discussion of resolutions.	S&OP cadence replaced by short, tactical, cross-functional touch-points relying on real-time information.
Hardwired into business	Owned by supply chain/operations; not integrated with company-wide functions.	KPIs[3] fully aligned across functions; planning fully integrated with all business processes.
Self-transforming	One-and-done projects replacing one black box with another.	New talent (e.g., data scientists) embedded in teams to pilot new use cases continually.

1. ERP = Enterprise resource planning
2. S&OP = sales and operations; IBP = integrated business planning
3. KPI = Key performance indicators

A major global agricultural input manufacturer faced significant inventory write-downs due to an internal culture of maintaining very high safety stocks ("never miss a sale" culture). It implemented lifecycle-based inventory optimization to intelligently define safety stock for each SKU, basis factors like product substitutability, gross margins, etc., leading to 50% reduction in inventory write-downs and $50M+ margin improvement.

5. Last mile network

Achieving resilience in last mile delivery requires dynamic optimization of transport routes and modes, based on real time cost, schedule, and Environmental, social and governance (ESG) impact data. Organizations use a variety of sub-levers such as direct shipment from plants, warehouse network redesign, outsourcing to 3PL/4PL players and strategic delivery partnerships with competitors/3PLs further minimize delivery risks.

90% of US Fortune 500 companies use 3PL providers for logistics and supply chain services. A leading US-based multinational 3PL firm uses algorithm-based dynamic route optimization, using all information available in the delivery area (such as historic traffic data), which in turn helps them reduce costs upto 20% and also lower 10% carbon footprint.

6. Demand forecasting

Latest advancements in demand forecasting involve use of Artificial Intelligence (AI)/ machine/ learning algorithms to ingest large amounts of structured/ unstructured data, as well as external triggers like weather patterns or foot traffic, and anticipate demand changes. Applying AI-driven forecasting to supply chains, for example, can reduce errors by between 20 and 50 percent, and

translate into a reduction in lost sales and product unavailability of up to 65 percent. Demand shaping strategies can further bring-in desired scenarios and improve critical metrics.

Some examples can be –

- Providing special offers for delivery time slots with low truck utilization.
- Increasing pricing of product variants with difficult to source components.

A French multinational food company achieved 20% reduction in forecast error and 30% reduction in lost sales by using machine learning algorithms for demand forecasting. A US-based technology giant leverages demand shaping by proactively promoting/de-promoting merchandise on online channels basis inventory levels. If a Personal computer component has excess inventories, the S&OP team advertises a daily list of promoted computer configurations that includes such components. Conversely, during inventories shortfalls, the team retracts advertisements for such configurations, increases their prices and lengthens delivery lead times.

7. Dynamic network design

Dynamic supply chain planning also allows flexible reaction to changing supply and demand situations. As companies build sufficient redundancy across the value chain and improve detection of internal/ external triggers (via control towers), it becomes easier to reroute material through the most convenient production/ warehousing/fulfillment channels basis changing requirements or constraints (e.g., productiondowntime in machines), provided that pre-approved Standard Operating Procedure (SOP) exist for handling most frequent/ severe disruptions.

A leading FMCG firm faced manufacturing cost and flexibility disadvantages due to legacy footprint in high-cost countries, which also made new product introductions difficult. The firm developed a distributed manufacturing footprint solution, looking at aspects such as global vs regional plays, make vs buy ownership of processes, etc., which led to a 3% reduction in operating costs and 50% reduction in new product launch lead times.

8. Enhanced operating model

Best-in-class supply chains deploy control towers as the normal way of doing business, not simply as war rooms set-up for times of crises and dismantled afterwards. Successful control towers share the following characteristics:

Empowerment to make critical decisions: Control towers cannot function properly if staffed only with relatively junior/mid-level officers. These structures require leadership and involvement of senior executives who are empowered to take decisions, supported by high-performing supply chain planners, customer service managers, supplier management, manufacturing operations, warehousing, and transportation officers (effectively building a cross functional team).

Access to high-quality data: To make timely decisions, control towers require a seamless flow of real-time, accurate data (from both internal and external sources) in user-friendly, digestible formats. Control towers should effectively act as the "single source of truth" for decision-making and maintaining transparency with stakeholders.

Scenario-planning capabilities: The most effective control towers are equipped with the tools, talent, and processes to conduct extensive scenario planning regularly and rapidly.

An electrical and industrial parts company was struggling with poor product availability and stock-outs due to low forecast accuracy. The firm turned-around the situation by implementing a digital supply chain control tower within 8 weeks, improving OTIF by 20% YoY. handle disruptions and improved 10% OTIF.

9. SKU rationalization

Best-in-class SKU rationalization uses postponement strategies to reduce active SKUs. Postponement, also known as "delayed differentiation," is a strategy that delays product differentiation at a point closer to the customer. It involves designing and developing standard or generic configurable products that can be customized quickly and inexpensively once actual consumer demand is known. Delayed differentiation can help reduce manufacturing costs, improve order fill rate, and reduce the risk of over/ under produced goods.

An Italian multinational fashion brand uses postponement strategy by producing merchandise in neutral, basic colors (e.g., white) with stable demand. Final color customization and dyeing is only done once accurate demand forecasts are obtained, leading to increased flexibility, lower inventory, and lower transportation costs. An American multinational CPG brand, which requires servicing of 350+ differently packaged SKUs owing to consumer demand, uses postponement by producing generic finished goods that aren't committed to a final Stock Keeping Unit (SKU), and outsources management & operation of packaging functions to a third-party. Final packaging into blister packs, paperfolding cartons, bundled offerings etc. is done based on real-time consumer demand. This strategy enables 10% improvement in inventory accuracy and 15–20% reduction in labor and packaging costs.

10. Organizational expertise

Implementation of aforementioned levers unarguably requires a healthy mix of internal (in-house specialists) and external (specialized startups/advisories) expertise. All of this can be housed within the supply chain control tower as separate COEs for effective utilization.

Multiple startups have emerged globally, specializing in convenient solutions for specific supply chain aspects like logistics optimization, last mile delivery management, etc. Few examples are as follows:

- One of the supply chain visibility platform uses AI to sift through data points across the supply chain to spot anomalies/risks. It serves as a major American shipping and logistics firm, as well as several government agencies.
- Other startup is a tail spend procurement solution which uses AI to optimize sourcing costs and find best deals for small-ticket tail spend purchases. It serves 100+ clients, including a British multinational oil and gas company, a British multi-national telecommunications company, and a leading American software firm.
- One of the E2E logistics management platform helps clients seamlessly in automated order management/dispatch, real-time route optimization, capacity planning, etc. and serves big players including a leading American multinational fast-food chain and a French multinational sporting goods retailer.

11. Aspirational KPI setting

Successful supply chain transformations require cross-functional buy-in and mindset change from the top leadership, guided by new metrics and aspirational outcomes which measure resilience and transparency (which may be different from the traditional supply chain metrics focused on cost, capital usage, service, and quality).

Global manufacturing has only just begun to adopt digital technologies such as analytics and artificial intelligence, the Internet of Things, Digitalization can deliver major benefits to efficiency, resiliency, and transparency by allowing new solutions for running scenarios, assessing trade-offs, improving visibility, accelerating responses, and even changing the economics of production. A leading example of such application is the centralized control tower system of an American multinational Consumer Packaged Goods (CPG) firm, which provides a company-wide view across geographies and products. It integrates real-time data, from inventory levels to road delays and weather forecasts, for its own plants as well as suppliers and distributors. When a problem occurs, the system can run scenarios to identify the most effective solution.

Preparing for future risk scenarios or investing in transparency will incur a present-day cost and may not make sense as a short-term investment – however, these investments can pay off over time, not only minimizing losses but also improving digital capabilities, boosting productivity, and strengthening entire industry ecosystems. Balancing between a lean/efficient supply chain and resilience/ transparency can deliver win-win for organizations.

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The CII Institute of Logistics (CII-IL), established by the Confederation of Indian Industry as a center of excellence, serves as a driving force in propelling the growth and competitiveness of the logistics and supply chain sector.

Through its array of services, CII-IL acts as a catalyst, elevating the performance of Indian supply chains to unprecedented levels by establishing a sustainable ecosystem through active stakeholder participation and a global network. This ripple effect not only empowers industries to garner deeper insights into emerging trends, but also enables them to tackle industry-specific challenges of national significance while adopting globally recognized best practices in the logistics and supply chain sectors.

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