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ET Edge

An Initiative by THE TIMES GROUP

Demystifying AI in the ever-evolving supply chain landscape

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Contents

Current technology and supply chain landscape

In the past few years, the global supply chain system has encountered unprecedented disruptions that have prompted organisations to re-evaluate their operational landscape and restructure overall business strategies. The COVID-19 pandemic followed by ongoing geopolitical tensions has rapidly manifested as multifaceted disruptions—from supply shortages to a deepening energy crisis.

The 2019 COVID-19 pandemic revealed vulnerabilities in overall supply chain systems and overreliance on single-sourcing strategies that led to critical resource shortages across industries such as semiconductors, pharmaceuticals, consumer electronics, and other various sectors.[1]

The Russia–Ukraine conflict also resulted in energy volatility across the globe. Recently, one of the most critical energy trade corridors across the Red Sea and Gulf of Persia has experienced severe disruption due to the Middle East crisis. Geopolitical tensions intensified by trade restrictions and sanctions are further impacting the supply chain ecosystem, limiting the trade routes and amplifying critical resource supply shocks, leading to price spikes with ripple effects across downstream sectors. Together, these disruptions have impacted critical raw materials supplies for oil dependent industries like chemical and petrochemicals, leading to a rise in the cost of logistics

Major disruptions in shipping connectivity and mobility have emerged due to rising tensions across these trade corridors. The modern shipping industry accounts for around 80% of global trade,[2] and any disruption around critical shipping corridors such as the Suez Canal and the Strait of Hormuz directly impacts the trade activities connecting South Asia and the rest of the world.

1 Bethmann, E., Hong, C., Jones, L., and Peterson, J., 2022. Challenges Facing Selected Industries and Related Global Supply Chains During the Ongoing COVID-19 Pandemic, Economics Working Paper Series, 2022-02-C, pp. 1–41.

2 UN Trade & Development. Review of maritime transport, 2024.

Key facts:

a) 25% of world trade in oil accounts for the shipping industry and passes through the Strait of Hormuz and 80% of it is headed toward south Asia.[3]

b) The Middle East contributes 30% of global oil production and 17% of natural gas.[4]

c) The Suez Canal accounts for 12%–15% of global trade.[5]

d) The shipping industry is currently avoiding the Suez Canal, with transit levels below 70% compared with 2023, and is re-routing traffic through the Cape of Good Hope.[6]

These unprecedented events across the globe explain how the supply chain ecosystem operates in a volatile, uncertain, complex, and ambiguous (VUCA) environment. In response, supply chains must shift the focus towards strategic thinking and not solely rely on operational execution.

In the contemporary supply chain context, organisations must stay ahead of changes to operate in this VUCA environment by identifying technological alternatives that can support accurate prediction and plan against such uncertainties. Unlike the traditional enterprise resource planning (ERP) systems that simply monitor key supply chain processes such as procurement, planning, and logistics, organisations now require much more robust data-driven platforms that can identify discrepancies in the system and predict potential outcomes.

Recent developments in artificial intelligence (AI) and the rise of large language models (LLMs) have enabled new generation platforms to leverage predictive analytics to generate real-time insights, end-to-end supply chain visibility, and ‘what-if’ evaluations. Ongoing developments in natural language processing (NLP) are bridging the gap between human experience and machine interface, making these platforms widely acceptable for enabling faster decision-making.

The ongoing transformation of new-edge platforms is now providing more visibility across supply chain functions by integrating end-to-end operations from demand planning, production, and warehousing to logistics operations. The emergence of agentic AI is revolutionising the way supply chains operate. Agentic AI’s reasoning capabilities and ability to establish its own understanding to identify disruptions across interconnected data systems and further plan and deploy the actions across various supply chain sub-functions keep it ahead of conventional AI and enable rapid execution and autonomous processes. Modern AI’s transformation is redefined not merely by better decision-making but by agentic AI’s ability to act independently and autonomously.

3 IEA, Strait of Hormuz: factsheet.

4 IEA, World energy investment 2025: Middle East.

5 UNCTAD

6 Safety4Sea, UNCTAD: Review of maritime transport 2025. September 25, 2025.

Understanding agentic AI in supply chains

Agentic AI in supply chains: Use cases

In a supply chain function, agentic AI is implemented as an integrated framework that connects planning, procurement, manufacturing, and logistics activities. The integration of various functions improves transparency across the overall supply chain and promotes well-informed decision-making across each function in real time. Some of the areas where agentic AI helps in a supply chain are:

Planning

Agentic AI enables integrated planning by adopting dynamic demand sensing and predictive analysis instead of merely depending on historical patterns. The system consistently analyses customer behaviour, supplier performance, and associated risks and can identify hidden patterns that may cause possible disruptions in advance. AI agents can test planning assumptions under various simulated scenarios and suggest changes in inventory policies, production plans, and replenishment strategies, enabling organisations to adopt proactive decision-making rather than reactive planning.

Manufacturing

Agentic AI augments manufacturing operations by establishing a responsive and interconnected environment that integrates real-time shop floor data from the internet of things (IoT) sensors. These autonomous agents can monitor equipment health, predict maintenance requirements, and recommend corrective actions before breakdowns and failures. Continuous feedback through real-time information flow helps these agents enhance process stability and throughput. While planning manufacturing, they can adjust production schedules and resource allocation as per the changing demand patterns and optimise the flow of materials and finished products on the shop floor.

Logistics

In logistics, AI agents use control towers and real-time data to improve and optimise transportation routes, redesign distribution networks, and optimise loads based on shifting conditions such as route disruption, capacity constraints, regional disturbances, and demand variations. This logistics network integration provides better supply chain visibility and tracking, optimising lead times, inventory replenishment, and distribution in real time.

Procurement

Agentic AI improves procurement cycles by transitioning from transactional to autonomous processes. Such agents manage end-to-end sourcing—from demand intake, purchase request consolidation, automated sourcing event creation, supplier discovery, and prioritisation. Beyond sourcing, agents are capable of managing negotiations by setting price baselines, organising multiple negotiation rounds, and recommending the best supplier based on price, lead times, and overall performance. These capabilities extend to contract drafting, obligation tracking, compliance monitoring, supplier onboarding, and risk assessment.

Collectively, these abilities make agentic AI a transformative engine capable of orchestrating end-to-end supply chain transformation by integrating reasoning-based abilities, robust decision-making, and execution across functions.

While potential applications of agentic AI across the supply chain are significant, leveraging this potential requires an organisation's readiness to integrate AI into their operating model. Establishing an AI-enabled supply chain requires digital infrastructure readiness, data maturity, and governance mechanisms, rather than presenting a top-down technology-driven initiative. Therefore, to leverage this transition, organisations must first establish the foundational elements required to ensure the successful adoption of AI solutions.

Transitioning to an AI-integrated supply chain

We conducted a survey in November 2025 with over 150+ senior executive respondents from five industries to evaluate their AI adoption, investment, and maturity across supply chain capabilities (see Annexure for details).

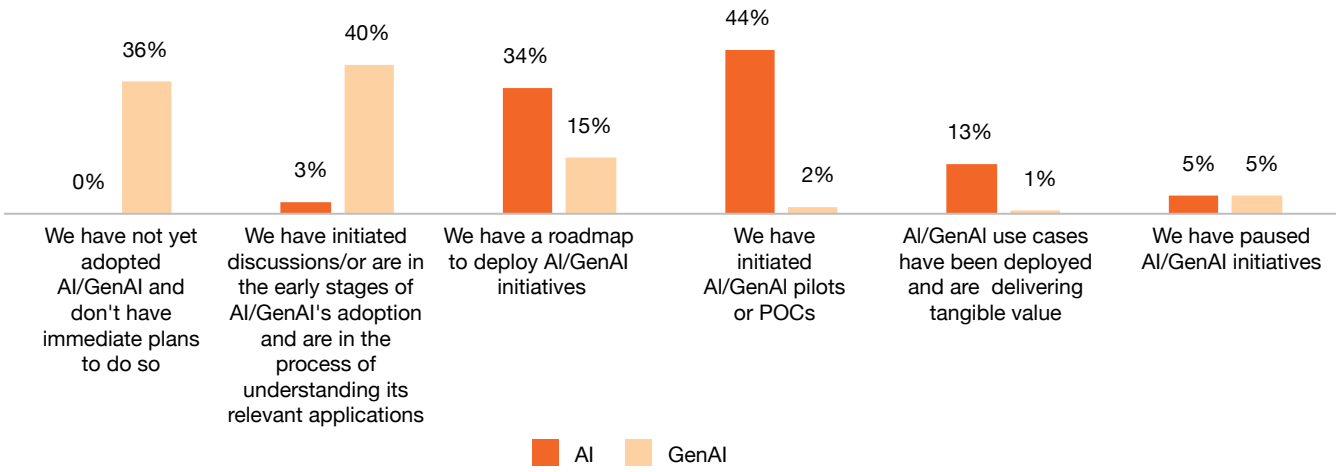
The survey revealed the following notable findings:

a) Organisations are still exploring agentic AI, and 40% indicate that they have initiated discussions and are in early stages of GenAI understanding, while 36% still have no immediate plans for adoption.

b) Around 34% of the surveyed organisations have a roadmap to deploy AI initiatives.

c) Around 44% of the organisations have initiated AI pilots or proofs of concept (POCs).

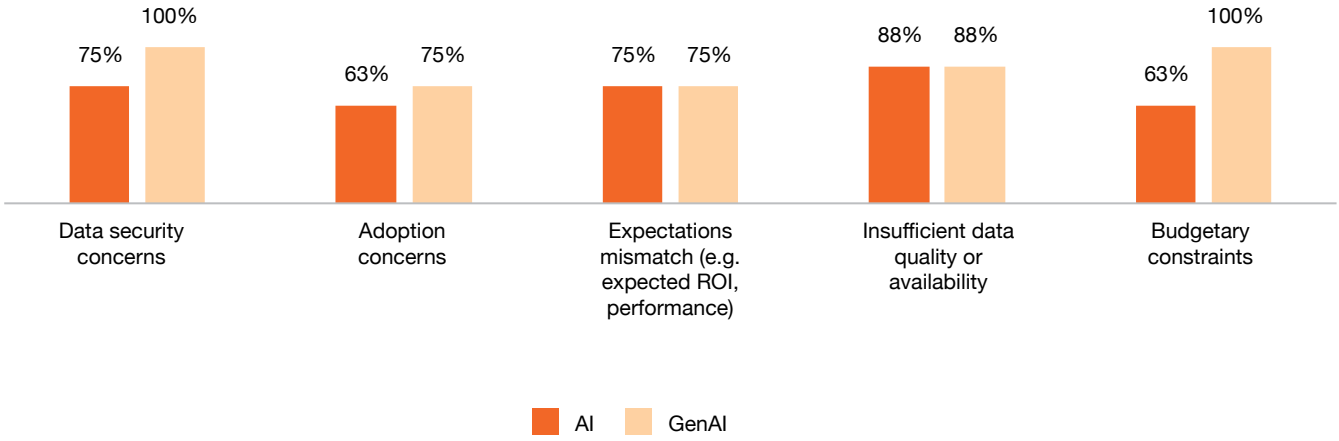
Figure 1: Status of AI/GenAI adoption in supply chains across organisations



Source: Survey conducted by PwC

Data security and budgetary constraints are some of the critical concerns that restrict organisations from AI adoption, followed by insufficient data quality and availability.

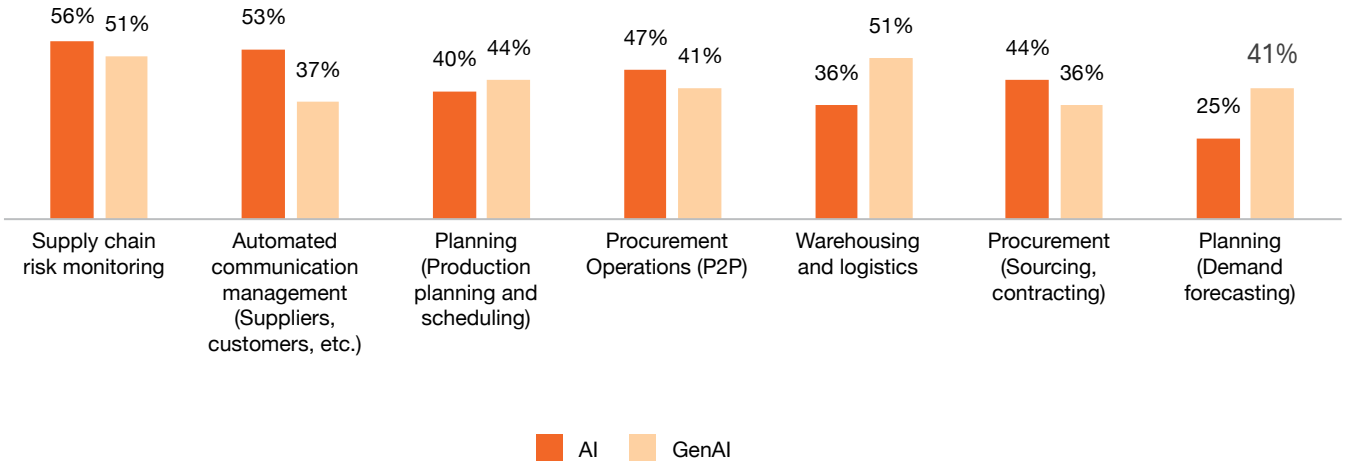
Figure 2: Reasons for pausing AI/GenAI initiatives



Source: Survey conducted by PwC

Organisations are seeking maximum AI/GenAI adoption in key supply chain areas, particularly risk monitoring, automated supplier-customer communication, and warehousing and logistics operations, followed by procurement and planning.

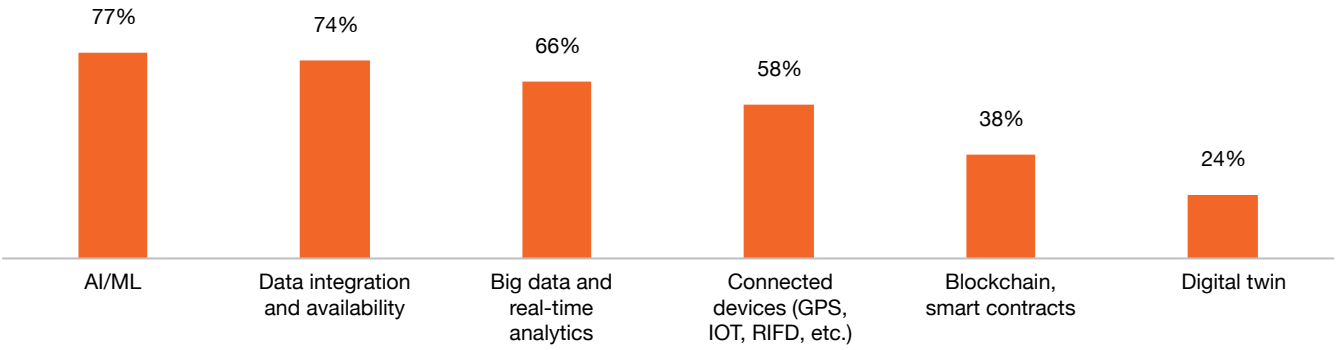
Figure 3: Top three critical sub-functions or areas in supply chains where organisations see maximum adoption of AI/GenAI use cases



Source: Survey conducted by PwC

77% of respondents indicate that AI/machine learning (ML) is helpful for improving transparency within the supply chain, while 74% state that data integration and availability are more critical.

Figure 4: Technologies that are being used to improve trust and transparency



Source: Survey conducted by PwC

Though the business use cases of agentic AI sound compelling, turning its potential into measurable value requires well-designed infrastructural capabilities that can translate this potential into scalable outcomes. The following factors determine whether an organisation is prepared to use AI for scalable outcomes.

a) **Leadership commitment:** AI initiatives are change initiatives that reshape culture, operating models, and decision rights. Even the most promising deployments can stall without continuous leadership support. Visible leadership commitment promotes cross-functional accountability and cultural acceptance.

b) **Connected digital ecosystem:** In environments that lack a connected digital ecosystem, AI solutions will remain underutilised, isolated, and would be unable to drive end-to-end optimisation. Integrated systems and real-time data flow are essential for realising value from AI technology.

c) **Alignment between business and technology teams:** Business stakeholders and technology teams should collaborate by defining use cases and configuring scalable AI solutions since the strongest deployments often emerge from shared ownership.

d) **Governance frameworks:** Stringent governance frameworks are necessary for ensuring sustainable AI deployment and regulatory compliance. Clear accountability, transparency, and continuous outcome monitoring are the key pillars of governance.

e) **AI literacy across supply chain functions:** Even the best models will fail to deliver if AI literacy is lacking as it could lead to lack of trust in AI-led processes and low adoption rates. To provide adequate AI literacy, users must be trained on how to implement AI recommendations and introduce humans into the decision-making loop for important use cases.

f) **Data maturity:** To excel in the field of AI, organisations must clearly define data ownership, run continuous quality checks and initiate improvements, collate historical data, and establish scalable data pipelines of standardised data.

The current phase of AI development fundamentally differs from the previous phase, primarily due to data availability. Many organisations are actively deploying IOT devices and digital sensors across operations, enabling real-time data capture for critical equipment and processes. Furthermore, cloud computing advances and LLMs' evolution have made access to AI more democratic, enabling interaction via NLP and reducing barriers to adoption.

In the supply chain context, AI is entering a value realisation phase with the ability to reduce systems' complexity and increase autonomy using connected digital ecosystems and agentic models. The answers to the following questions provide some clarity on the current adoption of AI models in supply chain operations:

a) Where are we on the supply chain AI lifecycle?

Supply chain AI is transitioning from the hype phase to early-stage adoption. Although only small-scale transformations have been possible from an end-to-end perspective for the entire enterprise, value has been repeatedly obtained from specific use cases in areas such as planning, forecasting, inventory, and procurement.

b) What is expected to change in the future?

AI is expected to move from supporting decision-making to progressively automating it. Data-driven, near real-time decision-making will become the norm and will further improve supply chain agility and resilience.

c) What is the specialised vertical agent?

AI agents mapped to specific functions such as procurement, supply, demand and logistics others could bridge the gap between data insights and business context. They could also make more autonomous and accurate decisions within each function.

d) What's next in AI for the industry and functions?

The next AI leap is expected to come from agents operating across entire supply chain ecosystems, combining internal data from various functions and external signals from relevant industries.

Today, AI in supply chains is gradually progressing from POCs to practical applications. The technology has matured enough to be integrated across the various functions of the supply chain for well-informed decision-making. The question that now arises is, how organisations can adopt, scale, and sustain this digital transformation.

The road ahead for AI-enabled supply chains

The approach towards integrating AI into supply chain operations and decision-making has shifted in recent times. What started as POCs and isolated pilots have now advanced into becoming strategic business priorities. AI is considered a critical enabler in designing agile, efficient, and resilient supply chain networks. Worldwide expenditure on AI development and deployment increased significantly in 2025, indicating businesses have evolved from the experimentation phase to early stage organisation-wide AI adoption.

Despite this momentum, a huge gap between ambition and realised outcome remains. Our 2026 Digital Trends in Operations Survey highlights this disconnect. 85% of surveyed leaders reported that they were ahead of their competitors in digital transformation; however, 89% of leaders admitted that their technology investments had not delivered the expected value. Additionally, only 27% respondents reported having fully embedded an AI-driven strategy across business units, and only 37% were comfortable delegating end-to-end processes to AI agents.[7] This indicates that many organisations remain trapped in pilot mode. In future, the success of AI adoption will no longer be measured by just AI deployment but the measurable business impact it delivers across organisations. While the initial numbers are subdued; with concerted efforts and consistent commitment, this could soon change.

7 PwC, Turning AI ambition into end-to-end reinvention: PwC's 2026 Digital Trends in Operations Survey.

Priority areas for CXOs

Drawing on our experience in advising global supply chain leaders, the following key priorities should be considered by CXOs for enterprise-wide AI adoption:

1. **Establish a strong digital foundation:** Data and digital architecture are the major elements that make an AI system powerful. Fragmented ERPs, siloed data lakes, and inconsistent master data pose significant barriers to scaled AI deployment. Our 2026 Digital Trends in Operations Survey reveals that 87% of operations leaders indicate that poor data quality has hampered their ability to achieve value from digital initiatives.[8]

With a growing focus on automation, many organisations today are deploying AI agents across finance, procurement, supply chain, human resources, and customer experience functions to reduce human dependency and faster decision making.

What CXOs should do now:

a) Invest in connected digital ecosystems with shared data foundations to enable seamless intelligence flow across functions.

b) Prioritise data quality, master data management, and integrate architecture before scaling AI use cases.

c) Build a cloud-native, API-driven infrastructure that enables AI agents' interoperability.

d) Treat digital foundation development as a multi-year capital commitment, not as a one-time IT project.

2. **Develop AI capabilities that deliver quantifiable business impact:** The next phase of AI in supply chains will be defined by how effectively the pilot capabilities are converted into measurable business outcomes. Each AI investment should begin with three fundamental questions:

a) Which business metric will improve?

b) What is the baseline performance and by how much will the baseline metric improve?

c) Is the organisation's processes and data mature enough to absorb scaled AI?

8 PwC, Turning AI ambition into end-to-end reinvention: PwC's 2026 Digital Trends in Operations Survey.

Mapping business outcomes to AI implementation is only half the work. The other half is ensuring that the business landscape is ready to adopt it and gain from it. Some of the functions where AI helps supply chain operations are:

a) **Planning:** AI/ML-based forecasting is rapidly displacing traditional statistical models, resulting in a shift towards touchless forecasting and improved key performance indicators (KPIs) such as forecast accuracy, inventory turnover, and service levels.

b) **Procurement:** AI-enabled supplier intelligence, autonomous sourcing agents, and AI-powered negotiation agents are now becoming prevalent in enterprise supply chain management software requirements, which could positively influence annual expenditure reduction and have a measurable impact on service levels, freeing employee bandwidth.

c) **Manufacturing:** AI drives predictive maintenance, automated defect detection, and yield optimisation, delivering material gains in productivity and quality.

d) **Logistics:** Route optimisation, warehouse vision systems, and AI-driven control towers are becoming primary areas of AI application and are directly improving 'on-time-in-full, cost-to-serve, and customer experience.

e) **Analytics and control towers:** AI is transforming traditional static dashboards into dynamic and decision-ready ecosystems, integrating real-time data across processes and enabling end-to-end visibility, exception detection, and predictive scenario modeling.

What CXOs should do now:

a) Build a portfolio perspective concerning AI use cases prioritised by business value, feasibility, and time-to-impact.

b) Mandate that every AI initiative has a defined KPI baseline, target uplift, and accountable business owner.

c) Invest in change management and workforce reskilling as AI capabilities can only deliver value when humans and machines work in collaboration.

3. **Create governance mechanisms that build trust at scale:** The nature of risk has fundamentally changed in AI implementation journey. In the early phase of AI adoption, every recommendation passes through a human checkpoint before a business decision is made by AI. This safety checkpoint is rapidly disappearing. In the era of autonomous and agentic AI, decisions are executed by machines in real time, with no human in the loop. The outcomes are already in effect before any errors can be identified.

Therefore, governance quality directly determines business outcome quality, allowing AI to be trusted, scaled, and embedded in core business functions. A well-governed AI system will catch a flawed forecast before it triggers an erroneous procurement order. A well-governed supplier risk model ensures that a legitimate vendor is not blocked. As per our 2025 Responsible AI survey, 60% of the executives indicated that responsible AI boosts return on investment and efficiency, and 55% reported customer experience and innovation improvements.[9] Governance has graduated from a compliance obligation to a measurable source of competitive advantage.

What CXOs should do now:

a) **Embed continuous monitoring and feedback loops:** Embrace continuous monitoring of autonomous AI agents to validate post deployment outcomes. Real-time drift detection, bias monitoring, and structured feedback loops should become standard practice.

b) **Implement processes for shared accountability:** Governance should not reside solely with IT. It must be co-owned by regulatory functions such as risk, legal, and business functions such as supply chains and sales, with clear escalation pathways when AI decisions deviate from intended outcomes.

c) **Ensure regulatory alignment:** Indian enterprises should align AI deployment with the Digital Personal Data Protection Act 2023, MeitY advisories, sectoral regulations from the Directorate General of Foreign Trade, the Central Board of Indirect Taxes and Customs, and the Bureau of Indian Standards, policy initiatives such as the India AI Mission, and NITI Aayog's Responsible AI framework. Global organisations should also comply with the European Union's AI Act and voluntary guidelines and the US National Institute of Standards and Technology AI Risk Management Framework.

The next few years will determine the supply chain leaders of the decade. The payoffs for those who act early will be significant. Our Reinventing Supply Chains 2030 report indicates that leaders pursuing holistic, enterprise-wide transformation are positioned to unlock supply chain cost reductions of close to 19% and revenue gains of around 16%.[10] The technology is mature, effective use cases exist, and the tools are in place. What remains is leadership conviction and disciplined execution and now is the time to move from intent to impact.

9 PwC, PwC's 2025 Responsible AI Survey: From policy to practice.

10 PwC, Reinventing Supply Chains 2030.

Annexure

Research methodology

1. Research design and approach

The study was designed to gather clear and measurable information from senior leaders about AI adoption and maturity in supply chains. It used a quantitative approach to collect responses that could be compared and analysed to understand current trends.

2. Target population and sampling strategy

The study was based on a sample of 156 senior leaders, carefully selected to ensure balanced representation. Chief supply chain officers made up 44% of the respondents, while the remaining 56% comprised CEOs, CFOs, CIOs, and other key supply chain leaders in near-equal proportions. Respondents were drawn from five core industries (manufacturing, retail and FMCG, construction and infrastructure, pharma and MedTech, and oil and gas), with nearly equal representation, offering a well-rounded view of supply chain dynamics across sectors.

3. Data collection technique and tools

The study was conducted through a structured online survey. A questionnaire was designed to capture insights on the evolving role of supply chains in strategic decision-making, the rise of supply chain leaders to CEO roles, priorities for a more strategic supply chain, digital transformation, AI adoption and its tangible value, disruption preparedness, and sustainability integration. Each question followed a close-ended format with five response options, ensuring consistency, ease of response, and meaningful comparison across roles and industries.

4. Data analysis

The survey responses were carefully reviewed and summarised. Results were compared across different roles and industries to identify important trends. Clear charts and graphs were used to present the findings, making them easy to understand.

5. Validity and reliability

To ensure credibility, the survey instrument was carefully designed to align with the study's objectives, supporting content validity. Questions were framed in clear, simple language to reduce ambiguity and minimise response bias. Reliability was strengthened by using a uniform questionnaire across all respondents, a standardised five-option response format, and a well-balanced sample of senior leaders representing diverse industries and organisation sizes. Together, these measures ensure that the findings are robust, consistent, and reflective of the broader Indian supply chain landscape.

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