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# MATERIALS MANAGEMENT REVIEW



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## IIMM BOARD OF STUDIES (BoS) MEETING



**BOS MEETING HELD ON 30<sup>TH</sup> AUGUST 2025  
AT THE ROYAL HABITAT CENTER, GREATER NOIDA**

## IIMM BOARD OF STUDIES (BoS) MEETING



*Nari Shakti Event was inaugurated by Chief Guest Addl Distt Judge Ms Sonica Choudhary along with Guest of Honour Ms Eva Yadav & Shakti Chairwoman Ms Priya Mogra and others*





## *From the Desk of National President & Editor in Chief*



Greetings from your National President!!!

The year 2025 represents a decisive turning point for global trade. In a world characterized by the ongoing impact of the COVID-19 pandemic, growing geopolitical tensions, and the undeniable urgency of climate change, traditional models of trade and supply chain management are undergoing a fundamental shift. It is no longer just about efficiency and speed, but about sustainability and resilience.

Trump's aggressive tariff regime casts a short-term shadow on key Indian export sectors and concerns at the economically weak MSMEs. While the impact— on GDP is not dramatic, the real cost lies in lost jobs, lost orders, and poor investor sentiment.

But adversity often breeds innovation. India's structural strengths and domestic demand are cushioning the shock. The emerging shift towards diplomacy, strategic autonomy, and economic diversification could redefine the country's growth trajectory.

Global trade, once defined by lean operations and just-in-time deliveries, is now being reimagined with long-term profitability and risk mitigation in mind. The disruptions of recent years have exposed deep vulnerabilities in the world's interconnected supply networks — from shortages of essential goods to delays in medical care and energy resources. The year 2025 marks the beginning of a new era— in which responsible trade practices, digital innovation, and environmental protection must take centre stage in global trade.

Sustainability is no longer an add-on, but a necessity. Governments, businesses and consumers are demanding supply chains that minimize environmental impact, respect human rights, and contribute to overall climate goals. From green shipping corridors and low-carbon logistics to eco-certification and ethical sourcing, the ecosystem of trade is shifting towards models that balance profit with the planet.

Global institutions are now being asked to enforce environmental standards in trade agreements, while private sector players are under pressure to meet ESG benchmarks. This year, we are seeing increased investment in renewable energy infrastructure for ports, electric freight vehicles, and innovations in packaging and storage — all with the aim of reducing the carbon footprint of global trade.

Resilience is just as important. The lesson from recent crises is clear: over-reliance on a single region or supplier can bring global operations to a standstill. In 2025, more and more companies are turning to supply chain diversification, regionalization and digital tools such as AI and blockchain to improve transparency, predict risks, and respond more quickly to disruptions.

Strategic stockpiling, reshoring, and public-private partnerships are on the rise as companies prepare not only for the next pandemic or geopolitical crisis, but also for ongoing climate-related events such as droughts, floods, and extreme weather conditions. Resilience today means preparing for a volatile tomorrow.

Real change in global trade requires collaboration. In 2025, we will see greater collaboration between governments, multilateral organizations, businesses, and academia. Events like the International Supply Chain & Logistics Summit (ISCL) foster the dialogue needed to align strategies, share innovations, and establish global best practices.

2025 is not just another year, it is a turning point. The actions we take now will determine the development of global trade in the decades to come. By prioritizing sustainability and resilience, the world can build a trading system that is not only more robust and adaptable, but also fairer and more future-proof. India stands at this global crossroads with unique advantages: digital dynamism, policy innovation, reshaped trade routes, and growing corporate leadership in sustainability.

This is our chance to redefine trade as a force for good — a system that promotes economic growth while protecting the environment and ensuring stability for all. The journey has begun, and the momentum must not be lost.

**Lalit Raj Meena**  
National President  
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# MATERIALS MANAGEMENT REVIEW

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## CONTENTS

PAGE NO.

|                                                                                                                                                          |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| ■ ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING (ML) DRIVEN SUPPLY CHAIN FOR FUTURE VISION                                                           | 5  |
| ■ CARBON CREDITS IN INDIA: A STEP TOWARD A SUSTAINABLE FUTURE                                                                                            | 8  |
| ■ CURRENT TRENDS IN SUPPLY CHAIN MANAGEMENT 2025: HOW TECHNOLOGY IS TRANSFORMING SCM                                                                     | 10 |
| ■ INDIA'S LOGISTICS COST WILL BE DOWN TO LESS THAN 10% BY DECEMBER: GADKARI                                                                              | 12 |
| ■ REFORMING INDIA'S LOGISTICS SECTOR                                                                                                                     | 13 |
| ■ SUPPLY CHAIN 4.0 - TRANSFORMING INDIA'S LANDSCAPE                                                                                                      | 16 |
| ■ THE RISE OF DIGITAL FREIGHT: WHY TECH IS TRANSFORMING GLOBAL LOGISTICS                                                                                 | 18 |
| ■ WTO UPDATE : FRONTLOADING, MEASURED RESPONSES CUSHION TARIFF IMPACT IN 2025 BUT RISK HIGH FOR 2026                                                     | 19 |
| ■ TECH MADE LIFE EASIER, BUT FOCUS HARDER                                                                                                                | 20 |
| ■ DIGITAL TRANSFORMATION, SUSTAINABILITY AND RESILIENCE ARE INCREASINGLY INTERTWINED IN INDIA'S SUPPLY CHAIN SECTOR                                      | 22 |
| ■ DIGITAL TRANSFORMATION, SUSTAINABILITY, AND RESILIENCE: THE TRIPLE HELIX RESHAPING INDIA'S SUPPLY CHAIN SECTOR                                         | 27 |
| ■ INDIA'S EVOLVING SUPPLY CHAINS: INTEGRATING DIGITAL TRANSFORMATION, SUSTAINABILITY, AND RESILIENCE                                                     | 30 |
| ■ 'WHY NATIONS FAIL OR SUCCEED': IMPORTANCE OF SOCIETAL INSTITUTIONS                                                                                     | 35 |
| ■ INSIDE OUT: MASTERING INNER BANI FOR SCM EXCELLENCE                                                                                                    | 37 |
| ■ HOW DIGITAL INNOVATION, GREEN PRACTICES, AND RISK RESILIENCE ARE SHAPING A SMARTER ECOSYSTEM AS A DRIVER OF THE FUTURE OF SUPPLY CHAIN SECTOR IN INDIA | 38 |
| ■ WINNING WITH COMPETITIVE ADVANTAGE - THE PATH TO BUSINESS SUCCESS: DRIVING GROWTH AND MARKET LEADERSHIP                                                | 45 |
| ■ BRANCH NEWS                                                                                                                                            | 49 |

NO. OF PAGES 1-60

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# ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING (ML) DRIVEN SUPPLY CHAIN FOR FUTURE VISION

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**Abstract :** This paper outlines the three important aspects of any supply chain, i.e resilient, responsiveness and collaboration. The applications of Artificial Intelligence (AI) and Machine Learning (ML) tools in achieving these things are also discussed. The author has highlighted the applications of ML tools in supply chain management covering the retail, manufacturing, transportation and healthcare sectors. The characteristics of resilient, responsive and collaborative supply chains are also discussed. For responsive supply chains, Amazon, Zara and Healthcare companies are examples. The applications of AI and ML tools are highlighted in healthcare, transportation, warehouse management; retail, logistics management and robotic process automation are also highlighted. The supply chain future vision and shaping towards the new trends are also discussed.

**Keywords:** Artificial Intelligence, Machine Learning, Resilient, Responsive, Collaborative, Future Vision

**Introduction :** Supply chain management is a tool or strategy to gain competitive advantage. The companies are gaining competitive advantage in three stages, i.e integration, collaboration and adoption. During the integration the total business value increase is say X, when the company move to next level (collaboration) it becomes 2X or 3X in terms of business value, further, it moves to the third level, it becomes more than 3X business value. During the adoption stage only, the companies adopts technology components, processes and practices

Artificial Intelligence (AI) and Machine Learning (ML) are poised to revolutionize supply chain management, creating more efficient, resilient, and responsive systems. This vision involves leveraging AI to optimize inventory management, predict demand, streamline logistics, and enhance decision-making across the entire supply chain.

AI is helping supply chains become more efficient, driving down costs, and predicting potential impacts before they become an issue. Automation and AI tools

are also helping more effectively forecasting supply and demand, reroute goods in real time, and avoid potentially costly delays. A significant 68% of supply chain organizations have integrated AI to enhance traceability and visibility within their operations. This technology boost has led to a substantial 22% increase in operational efficiency.

AI-powered demand forecasting model to support the customer experience. Amazon's supply chain has a new foundational AI forecasting model designed to predict what customers will want, where they'll want it, and when—for hundreds of millions of products per day.

**Machine Learning :** Machine learning (ML) is revolutionizing supply chain management by enhancing responsiveness, resilience, and collaboration. ML algorithms analyze vast datasets to predict demand, optimize inventory, and identify potential disruptions, enabling proactive risk mitigation and agile responses to changing conditions. This leads to more efficient, sustainable, and adaptable supply chains.

The primary purpose of machine learning is to discover patterns in the user data and then make predictions based on these and intricate patterns for answering business questions and solving business problems. Machine learning helps in analyzing the data as well as identifying trends

Machine Learning (ML) plays a crucial role in SCM by optimizing processes such as demand forecasting. It achieves more accurate demand predictions by analyzing historical data and external factors, which helps to mitigate out-of-stock and overstock situations. The integration of deep learning (DL) and machine learning (ML) approaches in SCM presents transformative potential, enabling more efficient management of the supply chain.

Machine learning in supply chain is used in warehouses to automate manual work, predict possible issues, and reduce paperwork for warehouse staff. For example, computer vision makes it possible to control the work

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of the conveyor belt and predict when it is going to get blocked.

### Applications of ML in Supply Chain

- i. Demand forecasting
- ii. Inventory management
- iii. Risk management and disruption prediction
- iv. Predictive maintenance
- v. Enhanced collaboration
- vi. Personalized recommendations
- vii. Automated decision making
- viii. Improved efficiency

### Examples:

**Retail:** Predicting demand for specific products based on historical sales data, weather patterns, and social media trends.

**Manufacturing:** Optimizing production schedules based on predicted demand and machine maintenance needs.

**Transportation:** Optimizing delivery routes and schedules based on real-time traffic conditions and weather updates.

**Healthcare:** Managing inventory of critical medications and supplies based on predicted patient needs.

**AI in Supply Chains :** The field of logistics has already experienced a dramatic change with the introduction of AI. A report by the U.K. Government outlines the future use of AI by U.K. businesses, showing a considerable increase in AI adoption and expenditure in various sectors, including supply chain management. According to Statista analysis, AI will be “critical” to 38% of supply chain and manufacturing businesses worldwide by 2025. Moreover, data indicates that 38% of logistics firms actively used AI, which resulted in up to 50% savings in operating expenses.

One of the most talked-about subjects in the U.K. now is environmental monitoring and sustainability. To lessen carbon footprints, supply chain processes and routes can be optimized by AI and ML. These technologies can also keep an eye on the state of the environment, and guarantee that sustainability guidelines are being followed. AI may give companies a competitive edge by assisting them in optimizing, automating, and innovating their shipping processes to greater levels.

Supply chain systems powered by AI are helping companies optimize routes, streamline workflows, improve procurement, minimize shortages and automate tasks end-to-end.

A supply chain can become complicated, especially for manufacturers of goods who oftentimes rely on their partners to ship their goods in a timely and organized

fashion. AI can keep all parts of a supply chain in balance with its ability to find patterns and relationships unlike a traditional non-AI system. These patterns can help optimize logistics networks all the way from the warehouse to cargo freighters to distribution centers (IBM, 2025). Specific technologies used are: AI, IoT, Digital Twins, Blockchain, Robotics & Automation and Generative AI.

AI and Analytics enabled use cases to control supply chain disruption are (Downie & Fina, 2025):

- i. Demand forecasting in warehouse supply and demand management.
- ii. Machine learning and AI for the longevity of transportation and logistics
- iii. AI in adding portability to supply chain loading process
- iv. AI for cost saving and revenue boost in supply chain
- v. Data analytics based strategic sourcing in supply chain

**Future Supply Chain Vision :** Vision is the starting point of any supply chain strategy. It involves setting long-term goals that align with the company’s overall business objectives. This aspect of supply chain strategy focuses on planning for future growth, ensuring sustainability, and preparing for technological advancements.

The future of supply chains envisions a landscape of optimized, automated, and highly responsive ecosystems driven by advanced technologies. This includes increased reliance on AI, IoT, automation, and big data to enhance efficiency, speed, and decision-making. Sustainability and resilience will also be key focal points, with a growing emphasis on ESG (Environmental, Social, and Governance) factors and the ability to adapt to disruptions.

The implementation of AI and ML has significantly enhanced response times and decreased costs in supply chain management, particularly in critical conditions. AI-driven systems are capable of continuously monitoring supply chain operations, identifying anomalies and potential disruptions in real-time. This facilitates prompt interventions, including the rerouting of shipments or the augmentation of inventory levels.

Artificial intelligence can streamline routine decision-making processes, including inventory management and order fulfillment, thereby minimizing human error and enhancing response times. During COVID-19, AI contributed to addressing supply chain issues by enhancing transparency through continuous monitoring, maintaining dynamic procurement strategies, and providing personalized solutions for disruptions caused by the pandemic, thereby improving supply chain

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resilience.

**Resilient Supply Chains:** A resilient supply chain is one that can withstand disruptions and recover quickly, maintaining operations and customer service. It focuses on building the capacity to anticipate, adapt to, and recover from various challenges, known and unknown, rather than just eliminating risks. Key characteristics include agility, adaptability, and alignment among stakeholders. The key strategies that make the supply chains more resilient are : Digital transformation, inventory management, visibility, regional configuration of supply chain networks and sourcing from neighboring countries.

**Responsive Supply Chains :** A responsive supply chain is designed to be agile and adapt quickly to changes in customer demand and market conditions. It prioritizes flexibility and speed over cost efficiency to meet fluctuating needs, making it suitable for businesses with unpredictable demand or short product life cycles.

#### Examples of Responsive Supply Chains:

**Zara:** The fashion retailer is known for its quick response to changing trends, using a responsive supply chain to bring new designs to market rapidly.

**Amazon:** The e-commerce giant uses a responsive approach to handle high order volumes and rapidly changing customer demands.

**Healthcare and Pharmaceutical Companies:** These businesses often need to respond quickly to sudden increases in demand for specific medications or medical supplies.

#### Collaborative Supply Chains

Supply chain collaboration is a strategic approach where businesses work together with their partners (suppliers, manufacturers, distributors, and even customers) to optimize the flow of goods, information, and services within the supply chain. It involves sharing data, processes, and resources to improve efficiency, reduce costs, and enhance customer service. Essentially, it's about moving beyond traditional, siloed operations to create a more responsive and agile network.

#### Examples of Supply Chain Collaboration:

- A retailer sharing sales data with its suppliers to anticipate demand and adjust production accordingly.
- Manufacturers collaborating with their suppliers to optimize inventory levels and prevent shortages.
- Logistics providers working with retailers to improve delivery times and reduce shipping costs.

- Companies using technology platforms to share information and coordinate activities across multiple tiers of suppliers and partners.

#### Key Trends Shaping the Future Supply Chains

The below mentioned aspects will shape the future supply chains:

- i. Digitalization and Automation
- ii. Enhanced visibility and collaboration
- iii. Focus on Sustainability
- iv. Resilience and Adaptability
- v. Human Machine Collaboration
- vi. Strategic Planning and Vision
- vii. Real-time decision Execution

#### Conclusion

The supply chains should be more resilient, responsive and collaborative. The contribution of AI and ML tools in achieving the supply chain future vision are immense. A resilient supply chain is one that can withstand disruptions and recover quickly, maintaining operations and customer service. A responsive supply chain is designed to be agile and adapt quickly to changes in customer demand and market conditions. Supply chain collaboration is a strategic approach where businesses work together with their partners (suppliers, manufacturers, distributors, and even customers) to optimize the flow of goods, information, and services within the supply chain. Supply chain effectiveness gives revenue and supply chain efficiency focuses on costs. The revenue should be improved and the costs should be reduced. AI and ML tools are used for cost reduction and revenue maximization. The companies like Amazon, Zara fashion styles, Wal- Mart etc good examples for adopting AI and ML tools as part of their supply chain management. New trends are shaping the future supply chain.

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# CARBON CREDITS IN INDIA: A STEP TOWARD A SUSTAINABLE FUTURE



**C**arbon credits represent the right to offset carbon dioxide emissions and can be traded within carbon markets. These credits are generated through initiatives that either reduce the amount of carbon dioxide released into the atmosphere or capture atmospheric carbon dioxide. The tradable nature of these credits facilitates the buying, selling, and transfer of emissions reductions, with a market price typically assigned to carbon emissions. Carbon markets are strategically designed to incentivize the reduction of greenhouse gas emissions, thereby promoting environmental sustainability, and supporting efforts toward a cleaner and more sustainable future.

## Carbon credits offer significant benefits

- On the environment front, these credits allow companies to offset the greenhouse gases and by doing so provide incentives through various sustainable projects.
- On the business finance front, it leads to a positive impact on the investors regarding the commitment shown by the organisation towards combating climate change. Thereby improving the brand image of the organisation. For instance, Reliance Industries have emerged as a significant entity leading to maximum investor appreciation in the carbon reduction sector. It has made several investments in the renewable sector and is focusing on green hydrogen production.
- Credits earned can be traded in the carbon markets and in turn receive incentives and financing for sustainable projects.
- It brings the world a step closer to achieving sustainable development goals.

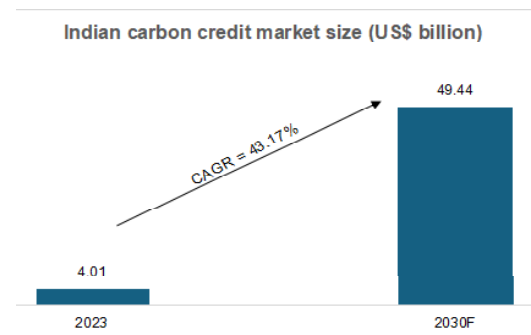
## Indian carbon market and system overview

The amended Energy Conservation Act, 2022 empowers Indian Government to establish carbon market and to authorise designated agencies to issue carbon credit certificates (CCC). Each CCC will represent one tonne of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e) reduction or removal from atmosphere. In July 2024, the Indian government implemented detailed regulations for the upcoming compliance carbon market as part of the Carbon Credit Trading Scheme (CCTS), covering both direct (scope 1) and indirect (scope 2) emissions.

The compliance mechanism, which attempts to address emissions from its energy usage and industrial sectors, and the offset mechanism, which encourages voluntary actions by entities for GHG reductions, are the two main mechanisms of the Indian Carbon Market Framework.

The government notifies obligated entities with a mandatory emissions intensity target (baseline), defined as tons of CO<sub>2</sub> equivalent per unit of output, for each year of the specified compliance period. Entities that overachieve their GHG emissions intensity target will be eligible for the issuance of CCCs, and entities that fall short of their target will be required to purchase and surrender an equivalent number of certificates to compensate for the shortfall. At the end of the compliance year, entities can bank any surplus certificates for future use or trade them with other participants.

The certificates will be exchanged via the national power exchanges. Entities with obligations must sign up on a national registry, while participation in trading is optional for non-obligated entities if they choose to engage. At the outset, the scheme will not permit over the counter (OTC) trading. The regulatory frameworks of CCTS are managed by the Ministry of Power.



Source: 6w research report, F- forecasted

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## Types of carbon credits in India

Indian carbon credits are generally categorized into two types: compliance carbon credits and voluntary carbon credits, both aimed at mitigating greenhouse gas emissions.

- **Compliance carbon credit:** These are mandatory for entities that fall under specific sectors, and to abide by the regulatory framework set by the government. It includes the Mandatory Carbon Credit Certificates (M-CCC) which are for the energy intensive industries. Companies such as NTPC, Tata Steel, Ultratech Cement are some of the organizations that adhere to compliance carbon market.
- **Voluntary carbon credit (VCM):** These are generated from projects that voluntarily reduce or avoid GHG emissions through their projects, thereby allowing non-obligated entities to participate in the carbon market. As of January 2022, there were 921 projects registered under the two leading carbon crediting programs, Verra and Gold Standard. By June 2023, this number had increased to 1,451 registered projects. These projects focus on renewable energy and sustainable agriculture practices, encouraging farmers to adopt sustainable practices while generating additional income through carbon markets.

## Regulatory and government initiatives

The immediate requirement to reach 'net zero' and the sustainable development goals is to implement robust policies and strategies that effectively reduce greenhouse gas emissions, enhance renewable energy adoption, and promote sustainable practices across various sectors. India amended its Nationally Determined Contributions (NDC) goal under the Paris Climate Agreement, aiming to cut greenhouse gas emissions intensity by 45% by 2030, rather than the previously set 33–35%, from 2005 levels.

By using the carbon credit certificates to price greenhouse gas (GHG) emissions, the Indian Carbon Market (ICM) emerged as a national framework for decarbonizing the economy. The ICM seeks to raise funds for low-carbon projects and technologies.

The Carbon Credit Trading Scheme (CCTS) has been revamped in June 2023, to maximize efforts towards reducing emissions by allowing non-obligated entities to participate in carbon markets thereby expanding to individuals and small entities. The CCTS also established sector specific GHG intensity benchmarks.

## Challenges and solutions of carbon credits

- The CCTS' complete implementation is projected to commence in late 2025 or 2026, almost three years later than planned. The energy sector is the focus of the present CCTS, which excludes other significant emitters like industries and transportation. This

limited scope delays the implantation of a comprehensive strategy aiming for carbon reduction and restricts the overall influence on national emissions. To enhance stakeholder participation in carbon markets, the CCTS has undergone ongoing improvements to enable individual involvement in the voluntary carbon market. A more effective solution would involve implementing targeted outreach programs and educational initiatives that inform individuals about the benefits and processes of participating in these markets, alongside creating accessible platforms for trading and investment in carbon credits.

- High compliance expenses related to monitoring, verification, and trade infrastructure are a problem for many industries, particularly micro, small, and medium-sized businesses (MSMEs). Participation in the carbon market may be discouraged by these prices, which can be prohibitive. To alleviate the burden of high compliance costs on MSMEs, targeted financial support and simplified regulatory frameworks should be implemented. Additionally, fostering collaboration among industries can enhance access to shared monitoring and verification resources, reducing individual expenses.
- The current system lacks standardised protocols, leading to inconsistencies in credit quality and undermining investor confidence. High verification costs can also be prohibitive for small-scale projects, limiting their ability to participate in the market. To tackle this challenge, ICM and CCTS frameworks along with other systems have been developed to have standardised protocols for the stakeholders.

## Outlook

India is well-positioned to become a global carbon credit supplier owing to its favourable geography. Carbon credit and carbon markets can foster economic growth by creating green jobs in the renewable energy, sustainable agriculture, and forest conservation space. By including agriculture, forestry, waste management, and transportation, India with the help of CCTS is tapping into a broader range of projects that contribute to emission reductions. This diversification can enhance the overall effectiveness of the carbon market. There have been several reforms in the CCTS such as including participation of individuals in carbon market trading. These initiatives not only position India as a leader in the global carbon offset market but also pave the way for sustainable development, ensuring a greener future while driving economic growth and resilience.

Source: IBEF

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# CURRENT TRENDS IN SUPPLY CHAIN MANAGEMENT 2025: HOW TECHNOLOGY IS TRANSFORMING SCM

ANNAPOORNA, ASSISTANT MANAGER - CONTENT

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**D**iscover the recent trends in supply chain management and how technology is transforming it. Additionally, understand AI's significance in supply chain management with a sneak peek of what lies ahead.

The efficiency of supply chain operations in today's global economy can make or break businesses. As the demand for transparency, speed, and cost efficiency is increasing, technology has become an important enabler of modern supply chain management for companies. In this article, we will explore how technology is transforming supply chain management. We will also provide insights into the current trends in supply chain management and what the future has in store for it.

**Challenges Faced by Traditional Supply Chains :** Traditional supply chains are faced with several challenges which can result into their inefficiency and ineffectiveness:

**Lack of Transparency :** Insufficient information in the supply chain makes it hard for products to be tracked and traced, leads to delays as well as causes misunderstanding.

**Reliance on Manual Processes :** Manual methods consume time and include mistakes since people are likely to make wrong decisions, thereby bringing about shortages in stock or errors in stocking.

**Absence of Synchronisation :** The participation of every player namely suppliers, manufactures, intermediaries and retailers within the supply chain is required. Other than that; this might lead to rising costs, inefficiencies and also disappointments among customers.

**Demand Patterns with Uncertain Possibilities :** Changes that were not anticipated may take place in terms of order quantities meaning that there will be difficulties in predicting and planning for production and inventory levels.

**No Adaptability :** Supply chains which are rigid cannot respond quickly enough if the market conditions change, preferences of consumers shift or emergencies such as earthquakes or recessions happen.

**How Technology is Revolutionising Supply Chain Management in 2025 :** In 2025, technology is making supply chains work much better. Automation uses robots and software to handle tasks like managing stock and shipping orders, so things get done faster and with fewer mistakes. Technology also helps managers make quick decisions by giving them up-to-date information, which helps solve problems quickly. Tools like GPS and sensors track shipments in real-time, so businesses know

exactly where their goods are and can fix delays right away. Predictive analytics look at past data to predict future trends and potential issues, helping companies plan ahead and avoid problems.

**Current Trends in Supply Chain Management (SCM) in 2025 :** These are some of the trends that are currently shaping supply chain management:

**Generative AI in Operations :** The Generative AI (GenAI) is revolutionising SCM by assimilating huge data sets and understanding specific supply chain environments. It helps procurement compliance, manufacturing efficiency and virtual logistic communication.

**AI-Enabled Low Touch Planning :** This makes planning for the supply chain more effective by using artificial intelligence which reduces manual work, uses advanced analytics to provide real-time insights and predict disruption, scale data analysis and improve planning processes for better decision-making and resource allocation.

**Transparency Beyond Tier 1 and 2 :** Regulatory compliance and risk management require gaining visibility into deeper tiers of the supply chain. Control towers, digital twins are among the technologies that enhance transparency and help firms comprehend sub-tier relationships thus improving the resilience of their supply chains.

**Low-Code Platforms :** Supply chain management is being revolutionised by low-code platforms that allow quick development and integration of applications with minimal technical skills. Their use streamlines processes across planning, manufacturing, logistics, etc making them adaptable in organisations.

**Electric Vehicles in Transport and Logistics :** The logistics sector is moving towards electrification and automation, with advancements in electric and autonomous vehicles. This shift aims to reduce emissions, improve efficiency, and enhance sustainability in transport and logistics networks.

**Future of Supply Chain Management/Emerging Trends in SCM :** The future of supply chain management is characterised by several emerging trends;

**Artificial Intelligence and Automation :** In the context of the supply chain management AI is quite crucial since as much as 85% of the companies now wish to adopt some AI related solutions while 45% expect effects on their supply chains. Areas such as sourcing, inventory management and logistics can be optimised by ai technology.

**Increased Focus on Speed of NPI :** Accelerated new product introduction has been ranked on top priority by companies as a result of specific economic and geopolitical situations globalizing markets competition. Collaboration between the procurement and supply chain teams in the early stages as well as utilisation of AI-compatible supply chain strategies can shorten NPI processes and increase their actual necessity.

**Customisation :** Companies are personalising their supply chains and also their production strategies if they are to remain in business. Management of custom orders and order processing can be enhanced by use of order automation as well as bespoke manufacturing services.

**The Internet of Things (IoT) :** IoT enable connection of various instruments and enhance numerous processes in supply chains, for example, warehouse management, vehicle management, and stock management. The increasing quantity of IT-based gadgets expands management power, control, and efficiency in the supply chains.

**Digitisation :** With cloud services, deployment of new applications to the regional nodes and organisations are kept simple. With the use of cloud applications, the target users particularly the managers and regional lessees require little additional training, hence their management is better.

**Risk Management and Resiliency :** Regardless of the prevailing business environment, risk management and resiliency capabilities should be created and developed. For example, It is possible to reduce technology risks and ensure technology investment effectiveness by such means as increasing the level of modern technologies used in the company and building partnerships with suppliers.

**Increased Visibility :** Supply chain managers are focused on several improvements within the supply chain, and enhancing supply chain visibility is still leading the priority of most of them. IoT, AI and PLM software possess the improved visibility which helps in faster problem solving and improvement of efficiency levels.

**Circular Supply Chain :** The purpose of the circular supply chain model is the recycling of materials and products, hence sustainability and reduction of associated costs like storage and transportation. This model's advantage does not end there as it also has some economic gains through waste reduction.

**Cloud-Based Solutions :** SaaS models are coming up as necessary features in management of the supply chain in terms of certain applicability. Cloud computing capabilities enable companies to streamline supply chains globally, thus improving the operational output.

To sum up, the use of AI, automation and big data analytics should help in making further improvements in supply chain management. These are going to resolve existing problems and take advantage of the improvements to enhance efficiency. The essence of being ahead of these trends is the surety of success in

Source: cleartax.in



## Indian Institute of Materials Management

### MISSION

- To promote professional excellence in Materials Management towards National Prosperity through sustainable development.

### OBJECTIVE

- To secure a wider recognition of and promote the importance of efficient materials management in commercial and industrial undertakings.
- To safe guard and elevate the professional status of individuals engaged in materials management faculty.
- To constantly impart advanced professional knowledge and thus improve the skill of the person engaged in the materials management function.
- Propagate and promote among the members strict adherence to IIMM code and ethics.

### CODE OF ETHICS

- To consider first the total interest of one's organisation in all transactions without impairing the dignity and responsibility of one's office :
- To buy without prejudice, seeking to obtain the maximum ultimate value for each rupee of expenditure.
- To subscribe and work for honesty and truth in buying and selling; to denounce all forms and manifestations of commercial bribery and to eschew anti-social practices.
- To accord a prompt and courteous reception so far as conditions will permit, to all who call up on legitimate business mission.
- To respect one's obligations and those of one's organisation consistent with good business practices.



# INDIA'S LOGISTICS COST WILL BE DOWN TO LESS THAN 10% BY DECEMBER: GADKARI

V. RAGHAVENDRA

**The Union Minister virtually lays foundation for 27 road projects and inaugurates two others costing about 5,235 crore in Andhra Pradesh**

Union Minister of Road Transport & Highways Nitin Gadkari on Saturday (August 2, 2025) expressed confidence that India's cost of logistics would come down to less than 10% by the end of December. The lesser the logistics cost, the more competitive would be the Indian economy to take on China and the U.S., Mr. Gadkari said. China's logistics cost was about 8% and that of the U.S. 12%. To reduce the cost of logistics, Mr. Gadkari said, the required transition from fossil fuels to electric mobility and biofuels was being made at a brisk pace, while developing the pan-India highway network, and sea ports, given the fact that water was the most economical mode of transport.

Speaking after virtually laying foundation for 27 road projects and inaugurating two other projects costing about 5,235 crore in Andhra Pradesh, Mr. Gadkari said water, power, transportation and communications were crucial for the development of any country, and a glaring example was the U.S., the reason for whose prosperity was undeniably its superior roads. Keeping this in view, the Ministry of Road Transport & Highways gave top priority to building highways that not only provide faster means of transportation but were also safe. Also, he stressed the importance of constructing sea ports, making due mention of the fact that apart from the major port in Visakhapatnam, Andhra Pradesh had a string of ports coming up along its 1,000-km-long coast with the support of Centre in tune with the priority attached by it to developing multi modal logistics hubs.

Mr. Gadkari said the transport sector was in for a significant transition from the usage of conventional fuels to more of blending them with ethanol and isobutanol across the spectrum of vehicles. Even blending hydrogen with biofuels was being experimented, and that the day when all these became a reality was not far away. Also, airplanes would sooner than later start flying with ethanol as a fuel.

Apart from the above road projects, the Union Minister sanctioned a greenfield highway between Hyderabad and Vijayawada, and widening the existing one to six lanes, widening of Vijayawada to Machilipatnam highway to six lanes, and four-laning of Guntur-Vinukonda highway, Guntur-Nizampatnam, Akiveedu-Digamarru, Pedana-Lakshmipuram, and Muddanur-Kadapa highways.

Mr. Gadkari said the number of road accidents was quite high in A.P. as indicated by a safety audit done by the Ministry on 100 highways, and told Chief Minister N. Chandrababu Naidu and Deputy Chief Minister K. Pawan Kalyan to duly focus on reducing them by making plans at the district level.

Source: thehindu.com

## OBITUARY



**SHRI PRASHANT YASHWANT BENDRE**  
**FORMER CHAIRMAN**  
**IIMM-PUNE BRANCH (1991 - 1993)**  
**VICE PRESIDENT, WEST (1993 - 1995)**  
**DISTINGUISHED MEMBER**

With deep sorrow and heartfelt grief, we announce the passing of Shri Prashant Yashwant Bendre on 2nd August 2025.

As you begin your journey into eternity, we bid you a solemn farewell. Your presence will be deeply missed, but your memory will forever remain in our hearts.

We are left with cherished memories and profound respect for a life that touched so many.

May your soul rest in eternal peace. Our sincerest condolences to the bereaved family.

In reverence & remembrance

**INDIAN INSTITUTE OF MATERIALS MANAGEMENT**  
**Pune Branch**

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# REFORMING INDIA'S LOGISTICS SECTOR

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**This editorial is based on “Road map for efficiency: India must rethink its transport strategy” which was published in The Business Standard on 15/04/2025. The article brings into spotlight the need for integrated transport planning in India to reduce high logistics costs and shift freight movement from roads to more efficient modes like rail.**

India is moving toward an integrated transport planning mechanism to **break down silos between different modes of transportation**. Currently, **road transport dominates freight movement (70%)**, while **railways lags behind (below 30%)** due to high tariffs from cross-subsidization. Multimodal transportation initiatives like the **Dedicated Freight Corridors** are beginning to show promise in enhancing efficiency. Successful implementation will require both interministerial cooperation and effective coordination with states to unlock economic growth potential.

What are the Key Growth Drivers of India's Logistical Sector?

- § **Government-led Policy and Regulatory Reforms:** The logistics sector's expansion is significantly driven by landmark policy interventions such as the **National Logistics Policy (NLP)** and **PM Gati Shakti**.
  - o These aim to address fragmentation in infrastructure planning and reduce logistics costs by integrating multiple transport modes.
  - o **GST** has streamlined interstate movement, eliminating bottlenecks and making India a single national market.
  - o According to the **Economic Survey 2023-24**, logistics costs dropped by 0.8–0.9% of GDP between FY14 and FY22.
  - Over **614 entities have registered on ULIP (Unified Logistics Interface Platform)**.
- § **Rapid Infrastructure Expansion and Multimodal Connectivity:** Massive investment in physical infrastructure is unlocking value in the logistics space through **dedicated freight corridors (DFCs)**, **multi-modal logistics parks**, and **port connectivity upgrades**.
  - o These projects promote efficient movement of goods, reduce turnaround time, and lower freight costs. This is complemented by the **Sagarmala, Bharatmala**, and **NIP (National Infrastructure Pipeline)** frameworks.
  - o For instance, **35 multi-modal parks are being developed with an outlay of 50,000 crore**.
- § **Digital Transformation and Tech Adoption:** Digitisation is accelerating logistics growth by enhancing visibility, cutting delays, and automating supply chains.

- o Tools like **RFID, GPS tracking, blockchain, digital twins**, and government portals like **ICEGATE** and **E-Logs** are transforming traditional systems.
- o These innovations reduce transaction costs, improve cargo predictability, and support real-time logistics management.
- o For instance, India rose **6 places to 38th in the World Bank's Logistics Performance Index (2023)**.
- § **Manufacturing-led Demand via Make in India and PLI Schemes:** India's aspiration to become a **global manufacturing hub** is creating new demand for modern, agile logistics networks.
  - o The **Production Linked Incentive (PLI)** schemes are drawing foreign and domestic investments, requiring seamless end-to-end supply chain services. Sectors like electronics, pharma, and textiles are particularly logistics-intensive.
  - o For instance, India's manufacturing contributed **15.3% to GDP in FY22** and is projected to expand rapidly with global shifts like **China+1**.
  - **Recent data projects India's GDP to hit \$6 trillion by FY30** and \$26 trillion by FY48 — logistics will be a key enabler.
- § **Booming E-commerce and Last-Mile Delivery Ecosystems:** The exponential rise of e-commerce platforms has redefined logistics demand, particularly in **Tier II and III cities**.
  - o **Fast delivery, returns logistics, and warehousing** are now integral to customer satisfaction, propelling investment in **hyperlocal logistics, micro-warehousing**, and tech-enabled tracking.
  - This is also giving rise to **reverse logistics** and demand for real-time supply chain responsiveness.
  - o For instance, The Indian e-commerce market is expected to reach \$200 billion by 2026. The **logistics sector is projected to grow to \$591 billion by FY27**, up from \$435 billion in FY22 (EY).
- § **Skilling, Formalisation, and Employment Opportunities:** A structured shift from informal to formal logistics has catalysed skilling, job creation, and better workforce productivity.
  - o Government-backed **Employee-Linked Incentive (ELI)** schemes and focus on **training for logistics and warehousing jobs** are transforming this traditionally unorganised sector. It also contributes to India's demographic dividend.
  - o The sector currently employs 22 million people and is expected to create 10 million more jobs by 2027.
  - **Organised players, who hold 5.5–6% of the logistics market in FY22**, are projected to grow at 32% CAGR till FY27.

- § **Sustainability and ESG-led Supply Chain Transition:** Growing environmental consciousness and **global ESG norms** are reshaping Indian logistics, prompting a shift toward **electric fleets, coastal shipping, energy-efficient ports**, and carbon-tracked supply chains.
- o India is aligning with global benchmarks like the **Carbon Intensity Rating** and **EEXI** for sustainable shipping. This also helps attract ESG-sensitive capital.
- Freight villages and coastal shipping corridors (like **Sagar Sethu portal**) are being expanded to cut emissions and logistics costs.

What are the Key Issues Associated with India's Logistical Sector?

- § **High Logistics Cost as a Share of GDP:** India's logistics cost **remains significantly higher than global benchmarks**, impacting the competitiveness of exports and domestic production.
- o The fragmented supply chain, over-reliance on roads, and lack of modal integration inflate costs.
- o **This affects MSMEs the most**, reducing their margins and limiting global competitiveness.
- o For instance, India's logistics cost is estimated at **14–18% of GDP (Economic Survey 2022-23)** while global benchmarks stand at around 8%.
- § **Modal Imbalance in Freight Movement:** India's freight movement is heavily skewed toward **roadways, undermining cost-efficiency and environmental sustainability**.
- o Multimodal logistics are still underdeveloped, with limited connectivity between rail, ports, and inland waterways. This limits economies of scale and causes congestion on highways.
- o For instance, **Roads handle 66% of freight**, while railways contribute 31%, and shipping just 3% (EY report).
- o **Inland waterways, despite being 60% cheaper than road**, are underutilised due to infrastructure gaps.
- § **Infrastructure Deficits and Project Execution Delay:** Despite policy push, infrastructure development is hampered by land acquisition issues, environmental clearance delays, and bureaucratic hurdles.
- o These delays cause cost overruns and limit private sector participation. Many logistics parks, DFCs, and port connectivity projects face slow execution.
- o For instance, **only 1,724 km of DFC completed against longer-term targets**; many Multi-Modal Logistics Parks are under initial stages.
- o Though the average turnaround time for the Major Ports has reduced significantly, it is still high - **48 hours (2023-24)**.
- § **Regulatory Fragmentation and Compliance Complexity:** The logistics ecosystem is governed by multiple ministries and departments, resulting in regulatory overlap and inefficiencies.
- o **Inter-state differences in rules, permits, and taxes** delay goods movement and increase transaction costs. Despite the launch of **PM Gati Shakti**, centre-state coordination remains patchy.
- o Enterprises have to comply with several hundred acts and rules, depending on the size and geographical footprint of the business. These include the **Carriage by Road Act, 2007 & Carriage by Road Rules, 2011** and the **Warehousing (Development and Regulation) Act, 2007**.
- Furthermore, some types of logistics companies also need to balance additional compliances contained in the **Foreign Trade (Development & Regulation) Act, 1992** and **Foreign Trade (Regulation) Rules, 1993**.
- o According to industry estimates, **compliance burden contributes to 20–25% of logistics delays in India**.
- § **Digital Divide and Low Tech Penetration:** Digital transformation in logistics is advancing, but unevenly — small players lack access to or knowledge of tech tools like RFID, IoT, blockchain, and predictive analytics.
- o This creates inefficiencies, especially in warehousing, cargo tracking, and delivery routing. The benefits of ULIP and E-Logs remain concentrated among organised players.
- o For instance, **only 5.5–6% of the logistics market was held by organised, tech-driven players as of FY22 (EY)**.
- § **Skilling and Human Resource Challenges:** India's logistics workforce lacks structured training in handling modern supply chain technologies, multimodal transport coordination, and ESG compliance.
- o **Over 90% of the logistics industry is unorganized, leading to low productivity**, unsafe work conditions, and limited career mobility. The absence of large-scale, formal skilling programs adds to inefficiencies.
- o Recent data highlight that **4.3 million additional workers will be required between 2024 and 2030 in this sector**, with concentrated demand in states like **West Bengal, Tamil Nadu and Maharashtra**.
- § **Sustainability and Environmental Concerns:** India's logistics sector is predominantly carbon-intensive, dominated by **diesel-based trucking, limited electrification, and inadequate green corridors**.
- o While ESG focus is rising, compliance remains weak, particularly among smaller operators. Coastal shipping and inland waterways — greener modes — remain underexploited.
- o For instance, the transportation and logistics sector accounts for approximately **14% of India's total CO2 emissions**.
- Despite policies like NLP Marine and Energy Efficiency Index adoption, the modal shift to sustainable transport is sluggish.



What Measures can India Adopt to Enhance the Efficiency of the Logistical Sector?

- § **Operationalising Integrated Multimodal Transport Infrastructure:** India must accelerate the implementation of **PM Gati Shakti** in tandem with the **National Logistics Policy (NLP)** to break departmental silos and synchronise investments across roads, railways, ports, and air freight.
- o By **mapping logistics corridors through the National Master Plan**, the government can enable seamless end-to-end cargo movement. Strengthening first- and last-mile connectivity will ensure full utilisation of dedicated freight and coastal corridors.
- o Building upon the recommendations of the **Bibek Debroy Committee**, there is a need for converging multi-departmental actions into an integrated logistics policy.
- o Creation of an integrated digital platform to facilitate a paperless environment across the logistics value chain and setting up a mechanism for periodic diagnostics and benchmarking of sectoral outputs.
- § **Promoting Cluster-Based Development of Logistics Hubs:** Developing **multi-modal logistics parks (MMLPs)** near **industrial corridors and SEZs** will create efficient cargo aggregation and distribution systems.
- o These hubs should provide unified services like warehousing, cold storage, and customs clearance under one roof.
- o Co-locating them with **freight villages and EXIM zones** can generate economies of scale. The government can prioritise strategic nodes through **Public-Private Partnerships (PPP)**.
- § **Strengthening Digital Logistics Infrastructure:** India must push for **full-scale digitisation** of logistics operations through platforms like **ULIP, ICEGATE, and E-Logs**, ensuring universal adoption by small and medium logistics operators.
- o Real-time cargo visibility, digital document exchange, and process automation should be scaled through incentives and mandatory standards.
- o A unified logistics data exchange architecture can

help de-risk supply chains. Enhancing cybersecurity and data privacy measures will build trust among stakeholders. This will also enable predictive analytics and AI-based logistics planning.

- § **Enhancing Rail and Waterway Utilisation for Long-Haul Freight:** Policy incentives should be introduced to **shift bulk cargo** from road to **railways and inland waterways**, especially for sectors like cement, steel, coal, and fertilisers.
- o Electrification of short rail links and expansion of inland water terminals can enhance modal share.
- o Linking **Sagarmala and Bharatmala** schemes to logistics planning will unlock underused maritime and road infrastructure.
- § **Creating a National Logistics Workforce Development Mission:** A dedicated skilling mission under **Skill India** and **Logistics Sector Skill Council** should be launched to build capacity in warehouse operations, multimodal handling, and digital tools.
- o Modular training tied to certification and employability incentives can raise sectoral productivity.
- o Special emphasis should be given to upskilling informal workers in emerging technologies and ESG compliance.
- § **Formalising the Unorganised Logistics Sector:** India should simplify compliance procedures and create an enabling environment for **small fleet operators, local warehousing agents, and truckers** to register, upgrade, and formalise their operations.
- o A unified logistics registration portal, low-cost finance, and simplified GST filings can ease this transition.
- o Logistics providers can leverage the ONDC platform to streamline operations, optimize routes, and consolidate shipments from various sellers.
- § **Leveraging Geospatial Intelligence and AI for Logistics Optimisation:** Integrating **GIS and AI-based analytics** with the Gati Shakti masterplan can enable real-time monitoring of traffic patterns, infrastructure usage, and freight flow bottlenecks.
- o Such insights can inform smarter logistics network design, investment prioritisation, and congestion management.
- o Predictive analytics can also help preempt supply chain disruptions. Collaboration between **ISRO, NIC, and MoRTH** can support deployment.

#### Conclusion:

India's logistics sector is undergoing a transformative shift through **integrated transport planning, digital innovation, and infrastructure modernisation**. Bridging modal imbalances and ensuring centre-state coordination will be key to realising cost efficiency and global competitiveness. This aligns with **SDG 9 (Industry, Innovation and Infrastructure)** and **SDG 11 (Sustainable Cities and Communities)** by fostering resilient infrastructure and sustainable urban logistics.

Source: [www.drishtiias.com](http://www.drishtiias.com)

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## SUPPLY CHAIN 4.0 - TRANSFORMING INDIA'S LANDSCAPE

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**Introduction :** If India to become \$5tn economy, a few important steps to need to be taken include exploit the opportunities for global trade and become a preferred sourcing hub for the world. The country needs to make it simpler to manufacture and trade within India and globally. Investments in trade, infrastructure and adoption of digital supply chain alongwith robust logistics infrastructure are necessary to enable Indian businesses stay competitive at a global stage.

Supply Chain 4.0 encompasses the application of the Internet of Things, the use of advanced robotics, and the application of advanced analytics of big data in supply chain management: place sensors in everything, create networks everywhere, automate anything, and analyze everything to significantly improve performance and customer satisfaction. The incubator is the seed of Supply Chain 4.0 in the organization - fast, flexible, and efficient.

Long before industry 4.0 captured the collective imagination, supply chains have been critical cogs across industrial organizations. In recent times, though supply chains have grown to take increasingly worldly and complex shape on adoption of digital and physical technologies that expand the possibilities of what it can deliver. The advent of these technologies have enhanced the interconnected nature of supply chains and allowed it to evolve into more responsive than ever. With this, the supply chain has become more strategically critical component of the organization delivering greatest insights and enabling leaders to take better informed decisions

India's supply chain landscape stand on the cusp of a revolution with digital transformative capabilities pushing it to altogether new heights. Considering the backbone of the economy, India's supply chain ecosystem has potential to soar to new heights. The Indian logistics sector is expected to be worth \$380 bn by 2025, and given its immense potential, there is a need to understand the challenges faced by the sector and remove bottlenecks to progress. With India moving boldly towards claiming it's place in the global polity, we are witnessing a fast changing India. As our supply chain infrastructure improves, better regulatory

climate, strong global connect and inexpensive and accessible technology, present massive opportunities for Supply Chain Management practitioners to optimize their supply chains. It is only then that supply chain impact will be truly far-reaching and profound.

**Importance of Supply Chain :** Over the last thirty years, logistics has undergone a tremendous change, from a purely operational function that reported to sales or manufacturing and focused on ensuring the supply of production lines and the delivery to customers, to an independent supply chain management function that in some companies is already being led by a CSO - the Chief Supply Officer. The focus of the supply chain management function has shifted to advanced planning processes, such as analytical demand planning or integrated Supply & Operations Planning, which have become established business processes in many companies, while operational logistics has often been outsourced to third-party Logistics Services Providers. The supply chain function ensures integrated operations from suppliers to customers.

In the Indian context though, the digitally connected supply chain and its potential to drive innovation has yet to fully catch-on, India's nationwide infrastructure issues have often hamstrung our supply chain network, with challenges coming with the territory, be it transporting goods by road, rail or sea. Delay in movement is often the norm, and multiple tax regimes have been an age-old challenge to get over.

But introduction of GST has eased things considerably so can digital supply chains kick off the net major growth wave. Logistics costs currently account for as much as 14 percent of India's Gross Domestic Product (GDP), and smart supply chain solutions can play a major role in keeping their costs in check.

Industries as diverse as automotive, retail and manufacturing are adopting digital technologies to help reinvent their supply chains and increase business efficiencies. To note just two examples, Radio Frequency Identification (RFID) and Internet of Things (IoT) tools are already making their impact by way of operational efficiencies and cargo safety as well as reducing transport costs by increasing the speed of freight

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movement.

**Facets of digital supply chains :** The emergence of new digital and analytical capabilities, combined with significant policy changes and rising customer expectations, companies in India need to upgrade their supply chain processes. Advance economies with sophisticated logistics ecosystem have demonstrated the benefits of digital transformation across the logistics value chain, including warehousing operations, freight transportation, and last mile delivery. Their advances can help improve the performance and efficiency of India's logistics sector. Five important facets of digital supply chain namely internet of things (IoT), automation, blockchain, cloud computing and big data analytics are discussed as under.

- i) **Internet of things (IoT):** it represents a unique technology transition that can enable predictive diagnosis and monitoring performance across the ecosystem. Advanced sensors can be deployed to monitor and detect risks pertaining to breakdowns, helping avoid process delays and fatal accidents. Additionally, global positioning system (GPS) and Radio-frequency identification (RFID) systems, are being used to provide real time visibility. This allows service providers not only accurately predict delivery times and improve asset utilization, but also increases engagement as customers track consignments in real time, reducing friction that used to exist on the customer side.
- ii) **Automation:** From the use of robots to self-driven vehicles and drones, automation is going to be a big part of the supply chain of the future. This will reduce manual intervention for better management of costs. Artificial intelligence (AI) can play a big role in this automation drive and improve the quality and speed of services. It also holds the potential to quicken any inspections, curbing the possibility of handling damage and cutting down on inventory holding time.
- iii) **Block chain:** It may be particularly suited to India, given the fragmented nature of India's logistics sector and the lack of common digital platforms to share information. The sheer quantum of manual data entry increases the risk of human error, and this would help in creating an end to end logistics system that is truly integrated.
- iv) **Cloud Computing:** As logistics become increasingly leaner, optimizing asset utilization will be pivotal to enhancing operational efficiency. Cloud computing can enhance collaboration and increase efficiency by allowing service providers to share fleets and networks effectively. It will allow vast

amount of data created across the entire value chain to be easily accessed for round the clock monitoring from anywhere.

- v) **Big Data Analytics:** Practitioners can drive future strategy by identifying improvements, all with the use of big data analytics. The possibilities are boundless, including estimating the remaining useful life of assets, identifying any operational inefficiencies, and slashing redundancies and costs. Data analysis can pay rich dividends, bringing together disparate stakeholders to deliver richer value than ever.

**Digital supply chain enablers :** The transformation into a digital supply chain requires two key enablers - capabilities and environment. Capabilities regarding digitization need to be built in the organization but typically also require targeted recruitment of specialist profiles. The second key prerequisite is to establish IT landscape, an innovation environment with a start-up culture need to be created. This "incubator" needs to provide a high degree of organizational freedom and flexibility as well as state-of-the-art IT systems to enable rapid cycles of development, testing, and implementation of solutions. Fast realization of impact is essential to get immediate business feedback on suitability and impact of the solutions, to create excitement and trust in innovations, and to steer next development cycles.

**Way forward :** India is prioritizing transformation of the logistics sector which will have direct positive impact on the economic growth. It reduces the cost of goods and services, improves global competitiveness among manufacturers and MSMEs, facilitated trade growth and creates new jobs.

One of the realities of modern day society is that supply chain generates huge amount of data, and this is equally true of modern supply chains. IoT is one definitive technology that will transform India's supply chain through the use of data analytics. It is possible to get real-time data at all points across the supply value chain: inventory levels, point-of-sale information, consumer buying habits, fluctuation in freight costs or raw materials can be adjusted for as needed.

New generation robotics, automated vehicles (AVs) in warehouses, blockchain, IoT sensors are going to permeate India's logistics sector. In the time to come, digital tools will spread across the entire value chain rapidly as organizations start to realize the value of their supply chains with these digital tools.

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# THE RISE OF DIGITAL FREIGHT: WHY TECH IS TRANSFORMING GLOBAL LOGISTICS

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In the past, freight forwarding was a complex and time-consuming process, heavily reliant on **paperwork, manual coordination, and limited visibility**. Today, digital transformation is reshaping the logistics industry, making global freight faster, more efficient, and highly automated.

But what exactly is driving this change? And why are **traditional freight forwarding methods no longer sufficient** in the modern supply chain? This article explores **how technology is revolutionizing global logistics** and what it means for businesses worldwide.

**1. The Traditional Freight Forwarding Challenge :** Freight forwarding has always been a backbone of global trade, ensuring that goods move seamlessly from one country to another. However, the traditional model has **several pain points**:

- **Lack of real-time visibility** – Shippers and consignees often struggle to track cargo movements, leading to uncertainty.
- **Manual processes and inefficiencies** – Booking shipments, handling customs paperwork, and coordinating with carriers are time-consuming and prone to errors.
- **Complex pricing structures** – Freight rates fluctuate due to multiple factors, making it difficult for businesses to get transparent pricing.
- **Slow response times** – With different parties involved, traditional freight processes can take days or even weeks to finalize.

As global supply chains become more complex, these challenges **slow down business operations and increase logistics costs**. This is where digital freight technology comes into play.

**2. How Technology is Transforming Global Logistics :** The shift toward **digital freight forwarding** is driven by several key technologies that are addressing long-standing inefficiencies.

- **AI and Automation: Enhancing Efficiency :** Artificial Intelligence (AI) and automation are **streamlining logistics workflows**. Instead of relying on emails and phone calls, **automated booking systems** now allow businesses to secure shipments within minutes. AI-powered chatbots assist with customer inquiries, while predictive analytics help companies **forecast demand and optimize shipping routes**.
- **Real-Time Tracking and IoT: Improved Visibility :** With the integration of **Internet of Things (IoT) sensors** and GPS tracking, businesses can now monitor their shipments **in real-time**. This level of transparency helps companies react quickly to delays, reroute shipments when necessary, and improve overall supply chain reliability.
- **Digital Marketplaces: Simplified Freight Booking :** Online freight marketplaces connect **shippers, freight forwarders, and carriers** on a single

platform. These platforms allow users to compare prices, book shipments instantly, and manage logistics more efficiently. The result? **Faster, cost-effective, and more transparent freight transactions**.

- **Blockchain: Securing Supply Chains :** Blockchain technology is helping **combat fraud, enhance security, and streamline documentation**. With **smart contracts**, customs clearance, payments, and compliance processes become more transparent and tamper-proof. This is especially beneficial in cross-border trade, where compliance requirements vary significantly.
- **Cloud-Based Solutions: Connecting Global Operations :** Cloud-based logistics platforms allow businesses to **access shipping data anytime, anywhere**. This enables seamless collaboration between freight forwarders, shippers, and suppliers, reducing delays caused by miscommunication.

**3. The Benefits of Digital Freight for Businesses :** For companies involved in global trade, adopting **digital freight solutions** offers several advantages:

- **Faster Shipping Processes** – Automation reduces booking and documentation time, enabling faster transit times.
- **Lower Costs** – AI-driven pricing models optimize shipping costs and reduce unnecessary expenses.
- **Greater Transparency** – Real-time tracking eliminates guesswork and provides better control over shipments.
- **Improved Compliance** – Digital documentation minimizes errors and ensures smooth customs clearance.
- **Enhanced Decision-Making** – Data analytics provide insights for optimizing supply chain strategies.

**4. Will Digital Freight Replace Traditional Freight Forwarding?**

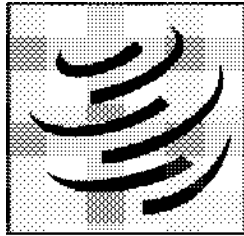
While technology is transforming logistics, it **won't completely replace traditional freight forwarding**. Instead, **digital solutions will complement existing processes**, allowing freight forwarders to operate more efficiently. Human expertise is still essential for handling **complex shipments, regulatory challenges, and personalized logistics solutions**.

The companies that **embrace digital freight technology** will have a competitive advantage, as they can provide **faster, more cost-effective, and transparent logistics services**.

The rise of digital freight is revolutionizing the logistics industry, **reducing inefficiencies, enhancing transparency, and improving global trade operations**. As businesses look for smarter and more agile supply chain solutions, adopting digital freight technology is no longer an option—it's a necessity.

Source: <https://www.jctrans.com>

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## WTO UPDATE

# FRONTLOADING, MEASURED RESPONSES CUSHION TARIFF IMPACT IN 2025 BUT RISK HIGH FOR 2026

**W**orld merchandise trade is now projected to grow 0.9% in 2025, up from the -0.2% contraction forecasted in April but down from the 2.7% estimate pre-dating the tariff increases. The upgrade is mostly due to frontloading of imports in the United States, WTO economists said in a forecast update released on 8 August. However, higher tariffs over time will weigh on trade, bringing next year's expected trade volume growth down to 1.8% from 2.5% previously.

A surge of imports in the United States in the first quarter ahead of widely anticipated tariff hikes contributed to the upward revision to the forecast for 2025 issued in the April Global Trade Outlook and Statistics report. Increased tariffs—including those that took effect this week—will dampen trade in the second half of 2025 and in 2026 (see Chart 1 and Table 1).

Director-General Ngozi Okonjo-Iweala said: “Global trade has shown resilience in the face of persistent shocks, including recent tariff hikes. Frontloaded imports and improved macroeconomic conditions have provided a modest lift to the 2025 outlook. However, the full impact of recent tariff measures is still unfolding. The shadow of tariff uncertainty continues to weigh heavily on business confidence, investment and supply chains. Uncertainty remains one of the most disruptive forces in the global trading environment.”

“Nevertheless, it is important that a broader cycle of tit-for-tat retaliation that could be very damaging to global trade has so far been avoided. The WTO Secretariat will continue to monitor developments closely, including further work on the impact of the latest tariff measures on the share of global trade conducted under Most Favoured Nation (MFN) principles. Work will also continue with members to safeguard the stability and predictability so essential to the world's trading system.”

**Chart 1: World merchandise trade volume growth, 2019–2026**  
Index, 2019=100 and annual % change



Note: Trade refers to average of exports and imports. Figures for 2025 and 2026 are projections.  
Sources: WTO for historical trade statistics. WTO Secretariat estimates for trade forecasts.

Asian economies are projected to remain the largest positive driver of world merchandise trade volume growth in 2025, although their contribution in 2026 will be smaller than predicted in April (Chart 1). North America will weigh negatively on global trade growth in both 2025 and 2026, but its negative impact this year will be smaller than previously estimated due to stronger-than-expected frontloading of imports in the US in the first quarter. Meanwhile, Europe's contribution to trade in 2025 has gone from moderately positive to slightly negative. Other regions, including economies whose exports are largely energy products, will see their positive contribution to trade growth shrink between 2025 and 2026 as lower oil prices reduce export revenues and dampen import demand.

Table 1 summarizes the current outlook for trade by region. North America's imports are expected to decline by 8.3% in 2025, less than the 9.6% drop foreseen in the April forecast. This positive impact was matched by a stronger-than-expected 4.9% rise in exports of Asia, up from 1.6% in the previous forecast. Europe's export and import growth this year of -0.9% and 0.4% respectively will be slightly weaker than we predicted in April while North America's exports will be less negative (4.2%).

**Table 1: Merchandise trade volume growth, 2023–2026 a**  
Annual % change

|                                 | 2023        | 2024       | 2025 <sup>a</sup> | 2026 <sup>a</sup> |
|---------------------------------|-------------|------------|-------------------|-------------------|
| <b>World Trade <sup>b</sup></b> | <b>-1.0</b> | <b>2.9</b> | <b>0.9</b>        | <b>1.8</b>        |
| <b>Exports</b>                  |             |            |                   |                   |
| North America                   | 3.6         | 2.3        | -4.2              | 0.7               |
| Europe                          | -2.9        | -1.7       | -0.9              | 3.6               |
| Asia                            | 0.2         | 8.0        | 4.9               | 1.3               |
| Rest of World                   | 3.9         | 3.6        | 1.2               | 1.3               |
| <b>Imports</b>                  |             |            |                   |                   |
| North America                   | -2.2        | 4.7        | -8.3              | -2.4              |
| Europe                          | -5.0        | -2.2       | 0.4               | 2.7               |
| Asia                            | -0.7        | 4.4        | 3.3               | 2.0               |
| Rest of World                   | 4.9         | 8.2        | 6.8               | 2.7               |

<sup>a</sup> Figures for 2025 and 2026 are projections.

<sup>b</sup> Average of exports and imports.

Sources: WTO-UNCTAD for historical trade statistics. WTO Secretariat estimates for trade forecasts.

The -0.2% projected trade contraction for 2025 in the April forecast was based on measures in place at that time (14 April), including the suspension of “reciprocal” tariffs by the United States. Subsequent US agreements with China and the United Kingdom raised the forecast for the year to 0.3%, but higher tariffs on steel and aluminium later brought it back down to 0.1%. The higher tariffs that came into force on 7 August will weigh increasingly on trade, but this will be balanced against positive impacts from frontloading and inventory accumulation, which will have to be unwound at some point. Positive tailwinds have also come from an

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improved macroeconomic climate, although this is subject to a high degree of uncertainty.

#### Components of interim updated forecast

On balance, the forecast for merchandise trade growth in 2025 has improved to 0.9%, which can be broken down into two positive factors and one negative one.

First, US imports surged in the first half of 2025, up 11% year-on-year in volume terms, due to frontloading and inventory accumulation. This rise included a sharp 14% quarter-on-quarter increase in Q1 followed by a 16% drop in Q2 (on a seasonally adjusted basis). Moving imports forward to Q1 should result in lower import demand in the future. This correction is expected to come in the second half of 2025, but some will occur only in 2026 and beyond. Hence, this factor will temporarily boost the outlook for 2025 trade. This frontloading factor contributes most to the updated forecast. It is worth noting that a similar, though less extreme, pattern can be seen in imports of other countries, possibly driven by fears of retaliation.

Second, the global macroeconomic outlook is now more favourable than many economists expected back in April. Contributing to the improved climate has been the depreciation of the US dollar against other currencies, which should ease financial conditions for developing economies. Falling oil prices should also support growth in manufacturing economies, although it may simultaneously reduce import demand in oil producing regions.

Third, recent tariff changes are expected to have an overall negative impact on the outlook for global trade compared to the April forecast. This stems from a combination of factors. On the one hand, the US-China truce and exemptions for motor vehicles are contributing positively; on the other hand, higher “reciprocal” tariff rates introduced on 7 August are expected to weigh increasingly on imports in the United States and depress exports of its trading partners in the second half of 2025 and in 2026.

Source : WTO Update



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## TECH MADE LIFE EASIER, BUT FOCUS HARDER

**SRINATH SRIDHARAN, CORPORATE ADVISOR &  
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**A**s digital convenience grows, attention spans shrink. Srinath Sridharan explores how technology has reshaped human focus, identity, and society—and why reclaiming attention is vital for cognitive health, empathy, and meaningful progress in the age of distraction.

We live in an age where constant distraction has quietly become the architecture of our daily lives. Waking hours dissolve into reels looping endlessly, emails and group chats that demand instant replies, and the insistent nudge of notifications we can neither silence nor ignore. Even the physical world conspires: the horns and clamour of city streets, the bright flicker of billboards at every turn, and the permanent display of screens in every hand.

At the heart of this is something deeply human: the yearning to belong, to be acknowledged, to be seen. Yet when these instincts are harnessed to turn attention into currency, something in our social fabric begins to fray. Almost imperceptibly,

our choices shift: cafés chosen less for warmth than for the photographs they yield; celebrations measured less by joy than by digital applause. Across generations, the impulse is the same—to avoid the discomfort of stillness.

#### The High Cost of Convenience

The smartphone becomes at once passport and prison: it offers a window to the world, yet quietly insists that our own lives remain incomplete unless broadcast and endorsed. In this dissonance, families lament children distracted at dinner, marketers puzzle over how to cut through feeds refreshing faster than thought, and professionals find themselves drained by the invisible labour of staying relevant.

The steepest cost is paid in attention itself. Once, it was unremarkable to hear a friend's story without glancing at a device, or to finish reading without interruption. Today, even modest focus feels aspirational. The discipline of concentration

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now flickers like a candle in a storm. What makes this more unsettling is how willingly—even gratefully—we have surrendered mental agency. Memory is outsourced to search engines, curiosity to trending topics, navigation to satellite maps. In the pursuit of convenience, we have traded the slow, effortful journey of understanding for curated feeds and algorithmic nudges.

Machines do not seize our cognition by force; they wait for us to hand it over, one notification at a time, lulled by the illusion of control. And so, without irony, we gather in conferences to debate whether artificial intelligence might someday overtake us, missing the quieter truth—it already shapes us, not by outthinking, but by deciding what we think about. The real peril is not that machines will become human, but that humans might forget how to be.

### From Passive Users to Active Stewards

Yet, these choices were never inevitable. The architecture of distraction was deliberately designed and refined by companies trading attention for profit. If distraction can be engineered, it can also be moderated—through thoughtful policy, ethical design, and responsible stewardship. Regulators and policymakers, tasked with protecting public interest, must look beyond data privacy into deeper questions: Does our digital infrastructure serve the human mind, or subvert it? The debate must extend into cognitive health and the strength of social cohesion.

Ultimately, what we need is deliberate and fair social engineering of technology. This is neither a retreat into nostalgia nor an argument against innovation. Rather, it is a conscious act of stewardship—to design digital systems that protect human cognition, nurture thoughtful citizenship, and preserve our capacity for reflection in an age of relentless distraction. In doing so, we affirm that technological progress must serve society—not silently reshape it in ways we only recognise when it is too late.

Technology's advance is now irreversible. The question that remains is how to balance human effort and cognition against what we gradually surrender in our quiet addiction—oops, adoption—of machines. It is tempting to call this collective folly. Yet history shows that knowing a

risk rarely stops us from courting it. Be it smoking, alcohol dependence, or other seductions of modernity, we embrace what harms us for reasons as layered as comfort, belonging, and escape. This too is part of being human—to see the cliff's edge, to know it, and still inch closer, unable—or unwilling—to turn away.

The economic toll of distraction remains largely unseen yet deeply felt: the erosion of productivity blunted by constant interruption, creativity reduced to derivative imitation, workplaces demanding instant responses and lamenting shallow thinking. As India leans into digital transformation, leaders would do well to ask what unseen drag this culture of distraction imposes on innovation, strategy, and sustained growth.

Beyond the economic calculus lies a more profound question: What kind of society are we shaping? A generation conditioned for reaction over reflection, and quick outrage over quiet reasoning risks losing its capacity for empathy, critical thought, and democratic deliberation. The damage can seep into public life itself—corroding trust in institutions, deepening polarisation, and narrowing the shared civic space where ideas once contended openly on merit. We must ensure technology remains an instrument of collective progress rather than an unseen force subtly reshaping society.

Even in these truths, something stubbornly human endures. At family weddings, playing with a child, or when connectivity falters, we remember how to simply be. Perhaps it is in these non-curated, or even inconvenient moments that we glimpse what it truly means to live—and to live as human. So too must our resolve: To reclaim our attention as the foundation of what makes us who we are. The true test of progress is not how fast we invent, but whether we remember to remain human in what we create.

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Source: Financial Express

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# **“DIGITAL TRANSFORMATION, SUSTAINABILITY AND RESILIENCE ARE INCREASINGLY INTERTWINED IN INDIA’S SUPPLY CHAIN SECTOR”**

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In the social and economic life of the country and in the lives and livelihoods of the common man, digital technology and supply chain management are considered complementary to each other. A farmer produces his food grains or vegetables and delivers them to a big trader through a vendor, and the business reaches the common man through a retailer. This process is called supply chain management. Where are the food grains or vegetables, what is their quality, when will they be available in the market, this process is called digital technology. Through which the social and economic development of the country is achieved from a business perspective and the lives and livelihoods of the common man are managed. Similarly, through various raw materials, business equipment, etc. and digital technology, the social and economic development of the country is achieved from a business perspective and the lives and livelihoods of the common man are managed. However, in general, by supply chain management we mean the transportation system. In short, supply chain management is the process of transferring goods from one person to another. These include education, information, correspondence, various raw materials, business equipment, technology, etc., through which the lives and livelihoods of the common man are managed and the social and economic development of the country is achieved.

However, the importance of the transport system as a means of supply chain management is immense. With increasing globalization, digitalization and industrial growth, the supply chain sector has become the backbone of India's economic development. From agriculture and manufacturing to e-commerce and pharmaceuticals, the supply chain supports various industries by ensuring the transportation of goods, supply management and timely delivery of services. The supply chain sector contributes significantly to India's GDP. Efficient supply chain management reduces costs, increases productivity and improves customer satisfaction. India's supply chain sector is a key pillar of the country's economic development, job creation and global competitiveness. Its importance spans across industries, regions and segments of the population, supporting everything from rural agriculture to sophisticated e-commerce platforms. But India's geography, population and economic diversity have also made its supply chain sector highly complex. Infrastructure is the bedrock of supply chains, fragmented and chaotic. A significant portion of the Indian supply chain sector is unorganized. Transportation and warehousing are dominated by small and medium enterprises. Despite the complexities and challenges, the sector is undergoing transformation

due to government policies, infrastructure development, technological innovation and rising consumer expectations. As India emerges as a global economic power, strengthening its supply chain system is crucial for achieving sustainable, inclusive and resilient growth.

The term “supply chain management” was first used publicly by Keith Oliver of the British logistics and consulting firm, in an interview with Arnold Kransdorf for the Financial Times on 4 June 1982. In 1983, the German Wirtschaftswache first published the results of a so-called “Supply Chain Management Project” led by Wolfgang Partsch.

“Digital Supply Chain” refers to how the development and implementation of advanced digital technologies (IoT, blockchain, machine learning, artificial intelligence, predictive analytics, etc.) can improve the traditional supply chain. In India, the regulation of digital technology in the supply chain sector is primarily handled by the National e- Governance Department (NEGD) under the Ministry of Electronics and Information Technology (Meit). This department promotes digital transformation in various sectors, including the supply chain, as part of the Digital India Initiative. Shri Piyush Goyal said that India is working with the European Union to develop modern technologies and secure the supply chain of critical raw materials.

Digital transformation is a holistic process that transforms every aspect of a business through digital technology, making it more efficient, customer-friendly and competitive. It is a process where business and organizational processes, culture and customer experience are redefined using digital technology to meet market demands and create new opportunities.

Information technology and the supply chain sector are a key driver of an organization's responsiveness and efficiency. It is essential for maintaining coordination among the various parties involved in the supply chain. Timely and accurate information helps supply chain personnel make the right decisions at the right time.

These decisions may be related to inventory levels, production levels, supplier selection, etc. In the absence of adequate and complete information, decisions made by supply chain professionals lose their rationality, which can affect coordination in the supply chain. Therefore, it becomes essential for organizations to manage information in the best possible way. To ensure smooth flow of information at various stages of the supply chain sector, organizations have started adopting a combination of various technologies. Information

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technology (IT) is the application of computers to store, retrieve, transmit and manage data for decision-making in an organization.

The digital transformations in the supply chain sector in India are:

- 1) Artificial Intelligence (AI) and Machine Learning (ML): AI and ML are transforming the supply chain sector by enabling predictive analytics, intelligent automation and data-driven decision-making. AI-powered solutions are being used to optimize inventory management, demand forecasting, supply chain and overall supply chain operations. AI and ML are revolutionizing the supply chain by providing greater visibility, efficiency and resilience. By leveraging these technologies, businesses can optimize their operations, reduce costs and gain competitive advantage in the market.
- 2) Internet of Things (IoT): The use of IoT makes the supply chain more efficient, flexible and responsive. IoT is an essential component in creating a digital supply chain. IoT connects physical devices and systems to the internet, enabling real-time data collection and monitoring in the supply chain.
- 3) Blockchain technology: Blockchain technology is creating more transparent, efficient, secure and trustworthy supply chains, which is benefiting both businesses and customers. Blockchain's distributed ledger technology increases transparency, security and traceability in the supply chain. This distributed ledger technology (DLT) allows all authorized parties to view and verify information, eliminating the need for intermediaries and reducing the risk of fraud and errors.
- 4) Cloud Computing: Cloud computing provides scalable and cost-effective solutions for data storage, processing and application hosting, which facilitates seamless integration and collaboration in the supply chain. Cloud computing is a transformative technology that is revolutionizing supply chain management by increasing visibility, collaboration, scalability and efficiency, while also improving security and decision-making capabilities. It enables increased visibility, better communication and faster decision-making, which ultimately increases agility and efficiency in the supply chain.
- 5) Data Visibility on Budget: Digital increases supply chain efficiency and helps reduce costs, such as providing data through inventory optimization and automated processes, which helps a company better monitor their available inventory, available transportation, and available supplies. For businesses operating on a budget, digital tools and techniques can significantly increase data visibility, leading to improved efficiency and decision-making.
- 6) Robotics and Automation: Robotics and automation are important tools for making supply chains more efficient, reliable, and profitable. It can increase

productivity by increasing human efficiency and accuracy in various areas of the supply chain. Robotics and automation are transforming warehouse management, logistics, and manufacturing processes, improving efficiency, accuracy, and safety. Robotics and automation increase productivity, efficiency, and accuracy in the supply chain. It can reduce costs by reducing the need for human labor in various areas, including various supply chain activities such as inventory management, warehousing, and transportation of goods.

- 7) Production and Inventory Management: Nowadays, every small, medium to large business organization has become more efficient through advanced analytics and data management through the use of technology like computers, laptops, mail, etc. By providing complete information, IT enables supply chain professionals to make appropriate decisions about inventory management. IT tools enable an organization to reduce inventory levels thereby preventing wastage. Digital technology significantly enhances production and inventory management within the supply chain by improving efficiency, visibility and decision-making power. Key technologies include AI, IoT, data analytics and cloud computing, which enable real-time tracking, predictive analytics and automation in various supply chain activities.
- 8) Anytime Demand Forecasting: Inventory holding cost (per unit/period), storage or storage cost (per unit/period), overtime limit, lay-off limit, the limits of digital technology in the supply chain sector need to be met at the right time. Digital technologies are revolutionizing demand forecasting in the supply chain sector by enabling more accurate, real-time forecasts and adaptive planning. These technologies, including AI, machine learning and IoT, analyze vast amounts of data to predict customer demand, optimize inventory and improve overall supply chain efficiency. By adopting these digital technologies, businesses can transform their supply chain operations, making them more efficient, resilient and responsive to modern market demands.

According to Evan J. Douglas, "Demand forecasting can be defined as the process of finding the value of demand for a future period."

In the words of Cundiff and Steele, "Demand forecasting is a proposed marketing plan and an estimate of sales for a specific future period based on a set of specific uncontrollable and competitive forces."

- 9) Inter-firm information systems: Digital technologies are transforming inter-firm information systems in the supply chain sector, leading to increased efficiency, visibility and responsiveness. These technologies enable improved data management, automation of processes, and improved collaboration across various supply chain functions. Digital technology systems facilitate the

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flow of information between a company and its suppliers and customers. The increasingly uncertain business environment has forced companies to adopt inter-firm information systems. These systems enable companies to eliminate unnecessary inventory pools at various stages of the supply chain. These systems enable the flow of information within a company's internal supply chain. Inter-firm information systems developed by companies include warehouse management systems (WMS), people management systems (TMS), supply chain control systems (DSS), and enterprise resource planning (ERP).

- 10) Logistics: Digital logistics has become a crucial part of the modern supply chain sector. It helps increase business efficiency, reduce costs, and improve customer satisfaction. Digital technology in the supply chain has made supply management more efficient, transparent, and reliable. These technologies include artificial intelligence (AI), Internet of Things (IoT), big data analytics, cloud computing, block chain, and more.

These technologies help in automation of supply chain processes, real-time tracking, data analytics, and risk management.

- 11) Transportation: Ride-sharing services like Uber and Ola have revolutionized the transportation industry through digital transformation. It helps people easily find a car and book a ride using their smartphones. Customers can book train, bus and flight tickets using digital technology, knowing where, when and how their transportation will arrive. Digital technology is revolutionizing transportation within the supply chain sector by increasing efficiency, visibility and responsiveness. Key technologies include AI and machine learning for route optimization and predictive analytics, Internet of Things (IoT) for real-time tracking and block chain for increased transparency and security. These advancements will reduce costs, improve delivery times and increase sustainability. Union Road Transport Minister Shri Nitin Gadkari has said that drivers will no longer have to stop at toll booths. He said that the government is planning to use a satellite-based toll system to collect toll tax on highways. Explaining how the new toll system works, he said that they are trying to launch it in the country very soon, which will have more benefits than FASTag. It is called a satellite-based GPS tracking system. Since the satellite-based GPS tracking system does not require the vehicle to be scanned or stopped at the toll plaza, it will reduce the time and fuel consumption of the vehicle. Also, there is a tax fee system if the driver travels less than 20 km within the toll area.
- 12) Security: Digital transformation provides assured security in the supply chain sector, enabling the safe movement of materials, products or technology from one place to another in the country, from the country to the outside world and from the outside world to the country. Digital supply chain

security includes protecting the digital aspects of the supply chain, such as IT systems, software and networks, from cyber threats such as malware, data theft and unauthorized access. It is an important part of overall supply chain security, which also includes physical security measures. Key aspects of digital supply chain security: cyber security, information security, third-party risk management, software supply chain security, etc.

- 13) Risk reduction: Digital transformation helps businesses adapt more quickly to market changes and reduce risks, enabling businesses to be more efficient and productive by using digital tools and platforms, which can transform their businesses from stagnation to prosperity. Digital technology offers significant potential for reducing risks within the supply chain sector by increasing visibility, automation, and predictive capabilities. Using technologies such as AI, block chain, and IoT, companies can gain real-time insights into their supply chains, predict potential disruptions, and optimize operations for greater resilience and efficiency.
- 14) Strategy development: Digital technology provides organizations with information about various aspects such as markets, customer needs and preferences, and economic conditions. It helps organizations formulate their supply chain strategies and make adequate plans for various activities such as production, distribution, and transportation. Creating a digital technology strategy for the supply chain includes using technologies such as AI, IoT and block chain to increase visibility, automate processes and improve overall efficiency. This strategy should focus on integrating systems, optimizing warehousing and logistics, and creating a more resilient and sustainable supply chain. A key aspect is the use of data analytics that gain insights and make informed decisions, which improves supply chain performance.
- 15) Employment Growth: The use of digital technology in the supply chain sector has created new employment opportunities. There is a huge demand for technically skilled workers and people experienced in digital transformation in this sector. New technologies such as artificial intelligence (AI), the Internet of Things (IoT) and blockchain are making supply chain management more efficient and automated, which is creating employment in a variety of new positions. Job opportunities in the supply chain sector due to digital technology include data analysts, supply chain optimization specialists, systems integrators, technical support staff, block chain developers, AI and machine learning specialists, and digital supply chain managers. This digital transformation has created a demand for new skills and experiences in the supply chain sector, which is creating new employment opportunities. It employs over 22 million people and plays roles in transportation, warehousing, purchasing, packaging, inventory

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management, and technology management. With increasing investment in infrastructure, warehousing, and digital supply chain platforms, the sector is expected to create millions of additional jobs, especially in semi-urban and rural areas.

- 16) E-Commerce: Digital technology is transforming the e-commerce supply chain sector by increasing efficiency, speed and visibility. Key technologies include e-commerce platforms, data analytics, AI, automation and cloud computing, which streamline processes like order fulfillment, inventory management and logistics. This results in demand forecasting, faster delivery times, cost reduction and improved customer satisfaction. Companies like Myntra, Mesho, Snapdeal, BigBasket, Swiggy, Ajo, Shopee, Amazon, Flipkart have completely shifted their businesses online, which is a shining example of digital transformation. So now we can shop online from the comfort of our homes.
- 17) E-Business: Digital technology is revolutionizing the supply chain sector by enabling e-business and creating more efficient, transparent and responsive operations. E-Business in Supply Chain Management (E-SCM) uses digital tools at every stage from procurement to delivery, resulting in increased efficiency, cost reduction and improved collaboration between stakeholders. Businesses can become more efficient and profitable by transforming from traditional supply chains to digital supply chains. Digital technology is transforming supply chains into more efficient, transparent and responsive ecosystems. E-business practices driven by this technology are essential for businesses to remain competitive, adapt to changing market dynamics and deliver exceptional customer value. It increases business efficiency, reduces costs, saves time and increases customer satisfaction. All business activities conducted on the Internet, e-commerce and beyond. Digital marketing, customer relationship management (CRM), enterprise resource planning (ERP), data analytics and many more, along with everything else in e-commerce. Online banking, online customer support, digital marketing campaigns, supply chain management, internal communication using online tools are examples of e-business.
- 18) Education: Digital technology is transforming the supply chain sector and education is adapting to equip professionals with the necessary skills. Digital tools and concepts such as AI, machine learning, block chain and big data analytics are increasingly being incorporated into courses and programs to prepare students for technology-driven industries. These include online courses, virtual simulations and real-world experience opportunities. Nowadays, educational institutions have also emerged as a part of the digitally transformed supply chain sector. This is because students can now take classes online from anywhere. Online learning platforms and digital learning tools have brought digital transformation to the education sector. In this case, artificial intelligence (AI), learning platforms are the means of delivering digital transformation information to the supply chain sector.
- 19) Healthcare: Digital healthcare platforms have now made it easier for patients to book appointments online, access medical records and consult doctors. Digital healthcare platforms are transforming the supply chain within the healthcare sector, increasing efficiency, transparency and patient care. These platforms use technologies such as cloud computing, Internet of Things (IoT) and data analytics to optimize processes from procurement to delivery. Ambulances are a shining example of digital transformation in the supply chain. The Covid-19 pandemic has highlighted the importance of a strong supply chain. India's ability to manufacture and distribute vaccines, manage essential goods and enable contactless delivery has demonstrated the resilience of its supply chain.
- 20) Banking system: Digital technology is revolutionizing the role of banking in the supply chain, increasing efficiency, transparency and security throughout the process. This includes improving supply chain financing using digital platforms, AI, block chain and other technologies, automating processes and facilitating better collaboration among stakeholders. Many banks now offer online transactions, account opening and other services. Moreover, it is possible to easily manage banking and co-banking apps from a smartphone or computer. Such as PhonePe, Paytm, GooglePay etc.
- 21) Bringing about cultural change: Digital transformation can also bring about changes in the way employees work and the overall culture. Digital transformation requires a significant cultural shift within an organization, embracing new technologies and ways of working away from traditional methods. This cultural change is crucial for successful digital transformation, as it ensures that the workforce is engaged, adaptable and ready to use digital tools effectively. New products, services and business models can be created.
- 22) Increases and improves resilience: Digital technologies, including digital, increase and improve resilience capabilities in various contexts at the individual, organizational and societal levels. It enables connectivity, remote work and critical role performance, improves communication, facilitates data analysis and reduces infrastructure and disruption. Digital technology makes supply chains resilient, helping to cope with disruptions caused by geopolitical crises, the Sustainable Development Goals and unexpected events such as natural disasters and pandemics.
- 23) Improving user experience or customer satisfaction: Using digital technology to deliver services to users can improve the customer experience. Because this

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is the ultimate goal of every supply chain. To serve customers properly, companies need IT to get updates on order status, product availability, delivery schedules, etc. This information helps improve the supply chain process; thereby ensuring timely delivery and meeting customer needs quickly.

- 24) **Political Involvement:** The political impact of adopting digital technology in the supply chain sector is undeniable today. The use of digital technology in the supply chain sector is a complex process that has political, economic and social implications. To fully enjoy the benefits of this technology, governments, businesses and other stakeholders need to take collaborative and coordinated actions. The use of this technology can increase the efficiency, transparency and resilience of the supply chain. Companies prefer to invest or conduct business in countries with a politically stable structure. Politically stable countries not only provide a market base for manufacturers, but also have specific rules and laws related to business. Conversely, an unstable political environment can create frequent legal troubles for companies. Therefore, companies consider political stability as an important factor while making decisions about their distribution network.
- 25) **Growth in International-Domestic Imports and Exports:** The combination of digital technology and supply chain management is ushering in rapid growth in Indian business development. Facilitating trade and global integration India's participation in world trade relies heavily on its supply chain infrastructure. An efficient supply chain facilitates international exports and imports by ensuring timely clearance, transportation and distribution. With India emerging as a global sourcing and manufacturing hub, especially under the "Make in India" and Production Linked Incentive (PLI) schemes, attracting foreign investment and integrating into global value chains, supply chain networks have become crucial. With the combination of digital technology and supply chain management, international-domestic imports and exports are also becoming accessible to Indian small and medium enterprises. India's major imports include crude petroleum, defiance materials, gold, coal, diamonds and petroleum gas. China, Russia, the United States, Saudi Arabia, the United Arab Emirates and Iraq are India's major importers. India's major exports include engineering products, petroleum products, defiance materials, tea, mangoes, electronic goods, pharmaceuticals and chemicals. India exports about 7,500 products to about 190 countries. India's total exports in the financial year 2024-25 were US\$ 824.9 billion, which is a new record. This is 6.01% higher than the previous year's US\$ 778.1 billion.

This includes both goods and services exports. India's Ministry of Commerce also said that India's overall exports of goods and services are likely to reach US\$ 1 trillion in the financial year 2025-26. India's foreign trade plays a vital role in its economy

and the government is taking various steps to strengthen this trade.

In short, in today's highly digitally competitive global marketplace, the rise of perishable goods and rising customer expectations have forced companies to place greater emphasis on their supply chains. Digital transformation in the supply chain sector is a sequence of activities that facilitate the movement of goods from the raw material stage to the final delivery of the product to the end users. The ongoing advancement in communication technology has motivated companies to implement new methods for managing their supply chain activities. The supply chain sector involves the integration of various functions including production, operations, purchasing, transportation and physical distribution. The primary goal of the supply chain sector is to ensure the timely delivery of products to customers through the integrated flow of physical products and related information. This, in turn, contributes to the profitable growth of companies by efficiently processing customer orders and supporting after-sales services. In addition, the most observed benefits of the supply chain sector include cost reduction in various areas such as inventory management, transportation, warehousing and packaging, which ultimately increases revenue. The supply chain sector improves the relationships between the various parties involved in a company's value chain, such as suppliers, retailers, wholesalers and customers.

Digital transformation is increasingly involved in bringing sustainability and resilience to the supply chain sector. For example, during some tanker deliveries, the tanker has an OTP lock, which the customer can open with his mobile OTP. Moreover, now every small and large transport and material is equipped with digital tracking and monitoring devices, so that it is possible to know where, when and at what time the materials will arrive. These changes have made the future of the Indian supply chain sector stronger and more efficient. According to the Prime Minister of India, Shri Narendra Damodar Das Modi, India has shown that digital innovation and democratic values can coexist.

He has shown that technology is a tool for inclusion, transparency and empowerment. Harnessing the power of technology has brought innumerable benefits to the people. Service delivery and transparency have increased immensely. Moreover, technology has become a means of empowering the lives of the poorest people. Union Minister for Road Transport, Shri Nitin Gadkari has said that road transport is both a cause and a symptom of a country's progress. According to some experts, the digital supply chain is not just a technological change, but an entirely new business model, where data-driven decision-making, collaboration and transparency are essential. Analyzing the opinions of different people, it can be said that digital technology has opened a new horizon in the supply chain sector, but for its successful implementation, it is necessary to consider various aspects, including technical, organizational, and human resources.

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# DIGITAL TRANSFORMATION, SUSTAINABILITY, AND RESILIENCE: THE TRIPLE HELIX RESHAPING INDIA'S SUPPLY CHAIN SECTOR

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**Introduction :** India's supply chain sector is at a transformative crossroads. As the country accelerates toward becoming a \$5 trillion economy, the convergence of digital transformation, sustainability, and resilience is redefining how goods are produced, moved, and consumed. These three pillars are no longer isolated strategies—they are deeply intertwined, forming a dynamic framework that is reshaping the future of Indian logistics and manufacturing. Once characterized by fragmented operations and manual processes, it is now embracing a future shaped by digital innovation, environmental consciousness, and strategic resilience. As global disruptions, climate imperatives, and technological advancements converge, Indian businesses are reimagining their supply chains—not just as operational backbones but as engines of sustainable growth and competitive advantage.

The triad of **digital transformation**, **sustainability**, and **resilience** is no longer optional. It is a strategic imperative. These elements are increasingly intertwined, each reinforcing the other to create supply chains that are agile, responsible, and future-ready.

This article explores how these forces are converging, the challenges and opportunities they present, and how India is positioning itself as a global leader in next-generation supply chains.

## 1. The Digital Backbone: Revolutionizing Supply Chains

### 1.1 The Rise of AI and Automation

India's supply chains are rapidly integrating AI, IoT, blockchain, and digital twins to enhance visibility, efficiency, and responsiveness. According to SAP India, AI is becoming the foundation of supply chain resilience, enabling predictive analytics, real-time monitoring, and autonomous decision-making.

Digital twins, for instance, are being used to simulate logistics scenarios, optimize asset utilization, and reduce downtime. These technologies are not just improving operations—they are enabling anti-fragile supply chains that thrive under stress.

India's industrial backbone—spanning infrastructure, manufacturing, logistics, pharma, and energy—has traditionally relied on manual procurement systems. However, the rise of digital supply chains is rewriting the

rules. Powered by cloud platforms, AI-driven forecasting, and real-time tracking, digital platforms have become the new control rooms of procurement.

Sector-wise impact:

- **Infrastructure:** Real-time tracking and automated purchase orders have reduced turnaround time by up to 25% and costs by 15–20%.
- **Pharma:** Digital platforms have improved supply chain visibility by 40% and accelerated supplier onboarding by 30%.
- **Energy:** Predictive maintenance and just-in-time inventory have cut procurement costs by 10–15%

Strategic benefits include:

- **Cost savings** through automated bidding and spend analytics
- **Time optimization** via faster approvals and reduced paperwork
- **Compliance ease** with audit trails and real-time dashboards
- **Agility** to respond to disruptions and market shifts

Digitalization is not just about efficiency, it's about enabling strategic vendor relationships, innovation sourcing, and long-term value creation.

### 1.2 MSMEs and the Digital Leap

India's 7.5 crore MSMEs are embracing digital tools like ONDC, TReDS, and Udyam Assist to streamline operations and access credit. Platforms like ONDC are democratizing e-commerce, allowing small businesses to compete with larger players by integrating into national and global supply chains.

However, challenges remain. Legacy systems, inconsistent data, and a lack of digital literacy continue to hinder full-scale adoption. Bridging this gap requires targeted skilling programs, affordable tech solutions, and supportive policy frameworks.

## 2. Sustainability: From Compliance to Competitive Advantage

Sustainability has emerged as a cornerstone of modern supply chain strategy. Indian companies are increasingly recognizing the need to reduce their carbon footprint, conserve resources, and align with global ESG standards.

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## Key sustainable practices include:

- **Green procurement** and eco-design
- **Reverse logistics** and circular economy models
- **Carbon footprint analysis** and life cycle assessments
- **Use of renewable energy and eco-friendly packaging**

### 2.1 Green Logistics and Circular Supply Chains

Sustainability is no longer a checkbox—it's a strategic imperative. Indian companies are investing in green warehousing, electric vehicle fleets, and circular economy models to reduce environmental impact<sup>4</sup>. The logistics sector, which contributes nearly 14% to India's GDP, is under pressure to reduce emissions and improve efficiency.

At the 2025 Supply Chain C Logistics Conclave, leaders emphasized the integration of ESG principles and carbon tracking into supply chain operations<sup>4</sup>. Companies are now measuring their "green line" alongside traditional financial metrics.

### 2.2 Policy Push and Global Expectations

India's commitment to net-zero emissions by 2070 is driving regulatory changes and incentives for sustainable practices. Initiatives like the PLI scheme, carbon credit markets, and priority sector lending for green projects are encouraging businesses to adopt eco-friendly models<sup>2</sup>.

Moreover, global buyers increasingly demand transparency and sustainability from their suppliers. This is pushing Indian exporters to adopt traceability tools, ethical sourcing, and sustainable packaging to remain competitive.

Challenges remain, such as:

- Lack of standardization and transparency
- Infrastructure limitations
- Supplier capacity gaps

### 3. Resilience: Navigating a Volatile World

Resilience strategies include:

- Diversification of suppliers and sourcing regions
- Strategic inventory placement and postponement tactics
- Real-time monitoring and predictive analytics
- Collaborative partnerships and stakeholder transparency

Digitization and AI are central to these efforts. Companies adopting AI have seen up to a 15% reduction in supply chain costs and a 10% increase in revenue. Predictive analytics help anticipate disruptions, while digital twins and control towers enhance visibility and decision-making.

#### 3.1 Lessons from Global Disruptions

From the COVID-19 pandemic to the Red Sea crisis and rising U.S. tariffs, Indian supply chains have faced a barrage of disruptions<sup>5</sup>. These events have exposed vulnerabilities in over-reliance on single trade routes, limited inventory buffers, and rigid logistics models.

In response, companies are adopting multimodal logistics, local sourcing, and scenario planning to build resilience. The shift from "just-in-time" to "just-in-case" strategies is becoming the new norm.

#### 3.2 The Role of Government and Infrastructure

The Indian government is playing a pivotal role in enhancing supply chain resilience. Investments in Bharat Mala, Sagar Mala, Gati Shakti, and the India-Middle East-Europe Economic Corridor (IMEC) are improving connectivity and reducing transit times<sup>5</sup>.

Trade agreements with ASEAN, UAE, and other regions are also helping diversify export markets and reduce dependency on traditional partners. However, high import duties and regulatory complexities still pose challenges, especially for SMEs.

#### 4. The Interplay: Where Digital, Sustainable, and Resilient Meet

##### 4.1 Data as the Common Denominator

At the heart of this transformation lies data. Reliable, real-time data enables predictive analytics, sustainability tracking, and risk management. However, as experts note, poor data quality can derail even the most advanced digital initiatives.

To address this, companies are investing in data fabrics, cloud platforms, and AI-driven insights that unify disparate data sources and provide actionable intelligence.

##### 4.2 Case Study: The MSME Transformation

MSMEs are a microcosm of this convergence. By adopting digital tools, they are improving efficiency. By embracing sustainability, they are accessing new markets. And by building resilience, they are surviving shocks and thriving in uncertainty.

For example, textile exporters in Tirupur are shifting focus from Europe to Africa, while pharma companies are expanding into Latin America. These shifts are supported by digital logistics platforms, alternative trade routes, and government incentives.

Micro, Small, and Medium Enterprises (MSMEs) form the backbone of India's economy, contributing nearly **30% to GDP, 45% to manufacturing output, and 40% to exports**. With over **110 million people employed**, MSMEs are vital to inclusive growth, regional development, and industrial diversification.

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However, MSMEs have historically faced challenges such as:

- Limited access to capital and technology
- Fragmented supply chains
- Low digital literacy
- Regulatory burdens
- Vulnerability to climate and market disruptions

The digital revolution has reshaped how MSMEs operate. Technologies like **cloud computing, AI, IoT, and mobile platforms** have enabled small businesses to automate operations, improve product quality, and expand market reach.

#### Key Drivers:

- **Government initiatives** like Digital India, Startup India, and MSME Champions Portal
- **Affordable digital tools** for inventory, CRM, and e-commerce
- **Social media and mobile commerce** for customer engagement

Climate change poses serious risks to MSMEs—damaging infrastructure, disrupting supply chains, and increasing financial volatility. To address this, initiatives like RISE (Resilient, Inclusive & Sustainable Enterprises) by WRI India are helping MSMEs transition to low-carbon operations.

- **Digital transformation** is not just about tools—it requires cultural change, leadership, and capacity building.
- **Sustainability** must be embedded into operations, not treated as a compliance checkbox.
- **Resilience** is built through diversification, collaboration, and proactive planning.
- **Policy support** and public-private partnerships are essential to scale successful models.

## 5. Challenges and the Road Ahead

### 5.1 Bridging the Digital Divide

Despite progress, a significant portion of India's supply chain ecosystem—especially in Tier 2 and Tier 3 cities—remains digitally underserved. Addressing this requires:

Affordable digital infrastructure Skilling and capacity building Public-private partnerships

### 5.2 Balancing Growth and Green Goals

Sustainability often comes with upfront costs. Balancing profitability with environmental responsibility is a key challenge, especially for MSMEs. Innovative financing

models, carbon credits, and shared infrastructure can help bridge this gap.

### 5.3 Policy Harmonization

While central policies are supportive, state-level implementation often lags. A coordinated approach involving inter-state platforms, simplified compliance, and real-time grievance redressal is essential.

## 6. Conclusion: A New Paradigm for Indian Supply Chains

India's supply chain sector is not just evolving—it is being reimaged. The convergence of digital transformation, sustainability, and resilience is creating a new paradigm—one that is agile, intelligent, and inclusive.

As India cements its position in global value chains, the ability to integrate these three pillars will determine its competitive edge. The journey is complex, but the destination—a robust, responsible, and future-ready supply chain ecosystems within reach.

### Conclusion

India's supply chain sector stands at a pivotal juncture. The convergence of **digital transformation, sustainability, and resilience** is not merely a trend—it is a strategic necessity for long-term competitiveness and national progress. These three pillars, once viewed as separate initiatives, are now deeply interconnected, each amplifying the impact of the others.

Digital technologies are enabling smarter, faster, and more transparent supply chains. Sustainability is driving responsible sourcing, energy efficiency, and circular practices.

Resilience is ensuring continuity and adaptability in the face of disruptions—from pandemics to climate events. Together, they form a robust framework for building supply chains that are not only efficient but also ethical, inclusive, and future-ready.

For India, with its vast network of MSMEs, diverse industries, and growing global influence, embracing this triad is essential. Policymakers, industry leaders, and entrepreneurs must collaborate to invest in digital infrastructure, promote green innovation, and build resilient ecosystems. Initiatives like industrial clusters, digital skilling, and climate adaptation programs are already showing promising results.

The path forward demands vision, agility, and commitment. By aligning technology with purpose and resilience with sustainability, India can redefine its supply chain sector—not just as a logistical function, but as a strategic driver of economic growth, environmental stewardship, and social equity.

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# INDIA'S EVOLVING SUPPLY CHAINS: INTEGRATING DIGITAL TRANSFORMATION, SUSTAINABILITY, AND RESILIENCE

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**Executive Summary :** India's supply chain ecosystem is undergoing a sweeping transformation; one that transcends incremental technological improvements to embrace a multidimensional model centered on integration, inclusivity, and intelligence. Rather than following traditional Western approaches rooted primarily in scale and efficiency, India's strategy is purpose-built for its socio-economic context, with digital transformation, sustainability, and resilience at its core.

Central to this evolution is the nation's ability to leverage its diversity through grassroots innovation, frugal engineering, and vibrant participation from local communities and MSMEs. This inclusive approach accelerates modernization while promoting equitable growth and stakeholder empowerment. With its focus on transparency, collaboration, advanced analytics, and circular economy principles, India is recasting legacy supply chains into agile, adaptive, and value-driven networks.

This progress is propelled by pioneering government initiatives like the Open Network for Digital Commerce (ONDC), Unified Logistics Interface Platform (ULIP), and Business Responsibility and Sustainability Reporting (BRSR), which collectively enhance transparency, interoperability, and accountability (NITI Aayog, 2022; DPIIT, 2023). The private sector has also been playing a pivotal role by aligning systems with stakeholder needs and driving innovation and agility. Together, these efforts are reshaping global value chains and placing India at the forefront of supply chain leadership.

Amid shifting macroeconomic realities, including pandemic aftershocks, climate change, and geopolitical shifts, India stands at a crucial inflection point. Overcoming challenges like infrastructure gaps and regulatory complexity will be essential, but with strategic coordination, India is well-positioned to build resilient, sustainable, and digitally empowered supply chains that deliver lasting, inclusive value both nationally and globally.

## 1. Introduction

India's supply chain transformation is distinguished by a strong alignment with its local context, a commitment

to inclusive growth, and a tradition of frugal innovation. Moving beyond traditional Western paradigms centered on cost and efficiency, India is embracing agile, integrated supply networks built on digitalization, sustainability, and resilience as core strategic pillars.

Flagship government initiatives such as Make in India, Digital India, Production Linked Incentive (PLI) schemes, and the National Logistics Policy (NLP) are laying the groundwork for a globally competitive logistics ecosystem. This evolution is characterized by the formal integration of micro, small, and medium enterprises (MSMEs) into organized value chains, empowered by digital platforms like ONDC and wider access to ESG-linked financing.

"Govt aims to make India a globally trusted partner in supply chains"

- Piyush Goyal, Minister of Commerce & Industry, July 6, 2025

Complementing these policy efforts, corporate programs such as Amazon's Saheli and Flipkart's green packaging mandates further underscore India's dedication to environmentally responsible and socially inclusive supply chain practices. Collectively, these measures represent a decisive shift from siloed, cost-centric models to robust, future-ready supply chains designed to generate lasting value for all stakeholders.

## 2. Drivers of Convergence

India's supply chain reinvention is shaped by the intersection of multiple drivers. Global shocks like the COVID-19 pandemic exposed the fragility of just-in-time models and triggered a global pivot toward diversification and risk mitigation (World Bank, 2021). Meanwhile, escalating climate risks from floods to extreme heatwaves are disrupting supply continuity, compelling companies to rethink logistics and sourcing strategies (IPCC, 2023).

"Green growth, energy transition, and digital public infrastructure are the pillars of Amrit Kaal."

-Nirmala Sitharaman, Union Finance Minister (Union Budget, Feb 1, 2023)

Geopolitical dynamics, particularly the emergence of

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the 'China Plus One' strategy, are positioning India as an attractive alternative for global manufacturing and sourcing (McKinsey & Company, 2023). Domestically, innovations such as ULIP, ONDC, and the PM Gati Shakti initiative are integrating digital and physical infrastructure (Ministry of Commerce & Industry, 2023). Simultaneously, regulatory tools like carbon accounting frameworks and sustainability-linked loans are institutionalizing green growth and accountability (SEBI, 2023).

### 3. Digital Transformation as the Structural Core

Digital technologies are no longer merely enablers; they are becoming the structural core of supply chain modernization. Artificial Intelligence (AI), Internet of Things (IoT), blockchain, and digital twins are enhancing traceability, agility, and predictive intelligence.

"Digital infrastructure is not just about convenience; it is the foundation of inclusive, sustainable commerce."

- T. Koshy, CEO, ONDC, ONDC Public Webinar, September 2023  
Coming to technologies, there are no limitations and extent to which technological adoption can happen, and this is an iterative and ever-evolving process to stay relevant.
- **Tata Steel** has piloted blockchain to trace iron ore sourcing, thereby ensuring compliance and improving stakeholder trust (Tata Steel, 2023).
- **Delhivery** leverages AI for dynamic capacity allocation, which has improved efficiency and reduced emissions during peak seasons (Kidwai, A. G., 2025).
- **Ninjacart** employs IoT-based sensors in cold chains to reduce spoilage and improve perishable food distribution (Ninjacart, 2023).
- **ONDC** has onboarded over 150,000 MSMEs, enabling them to digitally access larger markets (ONDC, 2024).

These developments underscore how digital infrastructure is serving as the nervous system of India's modern supply chain architecture.

An outstanding example of this focus, "Digital Saksham", has now reached over 3 lakh micro- enterprises across 13 states over 3 years, empowering them through digital tool adoption (CII, 2025).

### 4. Sustainability as a Strategic Imperative

According to the Centre for Science and Environment's (CSE) State of India's Environment Report 2022, India is

the third-largest emitter of greenhouse gases globally, with the supply chain sector accounting for a significant share of carbon emissions. Transitioning to sustainable supply chains can play a crucial role in reducing these emissions.

Sustainability is rapidly evolving into a strategic imperative. Rather than being a compliance requirement, it now serves as a key value differentiator. Innovations such as digital twins, AI- based optimization, and green hydrogen adoption are being deployed to reduce emissions and enhance resource efficiency.

Government interventions such as the Green Hydrogen Mission and FAME II scheme are incentivizing the shift toward low-emission logistics and electric mobility (MNRE, 2023). Industry leaders like ITC and Mahindra Group are actively pursuing decarbonization initiatives in packaging, logistics, and manufacturing (ITC Limited, 2023; Mahindra, 2023).

Consumer preferences further reinforce this shift. According to a study by NielsenIQ (2023), 77% of Indian consumers prefer environmentally responsible brands. Responding to this, companies like ReNew Power and Flipkart are embedding sustainability into logistics operations, packaging practices, and sourcing models (ReNew Power, 2023; Flipkart, 2023).

While inaugurating the third National Conference on Responsible Business Conduct (NCRBC) 2025, Minister of State Harsh Malhotra emphasized that "responsible business conduct is no longer peripheral to business strategy, but foundational."

CII's "Building Climate Resilience for Indian Industry" study introduced the "Physical climate Risk Assessment Framework" to help businesses prioritize adaptation actions across sectors and regions (CII, 2025)

### 5. Resilience Through Design

In India, supply chain resilience has evolved from a reactive concept to a strategic necessity, shaped by the nation's geographical diversity, infrastructural challenges, and exposure to frequent disruptions. Resilience here refers to the ability of supply chain systems to anticipate, absorb, adapt to, and recover from shocks, ranging from natural disasters and geopolitical tensions to health crises and market fluctuations, while maintaining operational continuity across the country's vast and varied terrain.

India's geographic diversity and infrastructural complexity necessitate resilient supply chains that are decentralized and data-driven. Modern resilience strategies now incorporate real-time coordination, distributed warehousing, and predictive risk planning.

- **ITC's e-Choupal 4.0** integrates climate data to anticipate crop yield variations, enabling proactive procurement (ITC Limited, 2023).
- **Gati Shakti logistics hubs** from Indian Railways are decongesting freight routes and facilitating market access for rural MSMEs (Indian Railways, 2023).
- **ONDC** supports cross-regional trade, offering business continuity during local disruptions (ONDC, 2024).
- During Cyclone Michaung, **ULIP** facilitated real-time coordination across 30+ systems, minimizing delays and enhancing response time (ULIP, 2023).

These examples illustrate how resilience has transitioned from reactive disaster management to proactive design thinking.

## 6. Fusion Points: Where Digital, Sustainable, and Resilient Systems Meet

In an era defined by climate urgency, rapid technological advancement, and global disruptions, organizations are increasingly recognizing that digital transformation, environmental sustainability, and operational resilience cannot be pursued in isolation. The true value of modern innovation emerges when these three dimensions converge, when digital systems are designed not just for efficiency, but also to reinforce environmental stewardship and build long-term resilience.

**Aditya Birla Fashion & Retail (ABFRL)** demonstrates this convergence by using blockchain to ensure supplier traceability while simultaneously investing in resilience planning to mitigate disruptions (ABFRL, 2023). Similarly, **eNAM (National Agriculture Market)** has empowered over 17 million farmers by integrating logistics, mandi data, and weather forecasting tools for informed pricing and planning (eNAM, 2023).

These “fusion points” are not just operational innovations; they are new models for holistic, future-ready supply chain ecosystems.

## 7. Barriers and Latent Opportunities

While India's supply chain modernization has made remarkable strides, structural bottlenecks persist not just as isolated issues, but as interconnected system failures that require deeper, design-led interventions:

**Behavioural Inertia vs. Adoption by Design:** MSMEs, especially in rural clusters, often exhibit resistance to adopting digital or ESG frameworks, not merely due to lack of awareness but due to misalignment with day-to-day business realities (e.g., informal operations, low margins, trust deficits).

**Digital Divide as a Structural Inequity:** Poor last-mile internet access and lack of reliable digital infrastructure continue to exclude vast segments of MSMEs from platforms like ONDC or ULIP.

**Policy Silos vs. Platform Thinking:** NLP, ONDC, PLI, and ESG frameworks remain policy islands, each operating on its own logic, timelines, and metrics, resulting in overlap, duplication, and underutilization.

**ESG Data Scarcity in the Long Tail:** Tier 2 and 3 suppliers lack affordable tools, incentives, or institutional handholding to generate auditable ESG data, resulting in poor traceability and exclusion from green value chains.

To unlock India's full potential, strategic interventions must focus on:

- Harmonizing policy and data frameworks across NLP, ULIP, and ONDC
- Establishing open, interoperable ESG data ecosystems
- Designing simplified, lightweight compliance protocols for MSMEs (NITI Aayog, 2025)

India's drive for future-ready supply chains must move beyond technology and environmental targets to give equal weight to the Social pillar of ESG. As S-RM (2024) notes, human rights, labour conditions, supply chain ethics, and community engagement are fast becoming decisive in investor, customer, and regulatory evaluations, yet they remain underrepresented in many corporate ESG strategies.

Viewed through the double materiality lens, these social issues are both impact imperatives and financial risk drivers. With over 60 million MSMEs, many in informal networks, India faces a dual challenge: meeting global due diligence mandates such as the EU CSDDD while leveraging this base for inclusive growth.

Initiatives like ULIP and ONDC are enabling digital traceability, and leaders like Tata Steel, ITC, and Mahindra are setting governance benchmarks. Still, significant gaps remain in social risk integration, local ESG scoring, and regulatory alignment. Closing them is essential not only for compliance but to secure global competitiveness, resilience, and social sustainability in India's supply chains.

## 8. Global Benchmarking

India can accelerate progress by learning from international best practices:

- **China** has adopted AI-driven automation across industrial supply chains (World Economic Forum, 2023)

- **Singapore** exemplifies seamless public-private logistics interoperability (Singapore Ministry of Transport, 2023)
- The **European Union** has pioneered ESG disclosure standards and circular economy legislation (European Commission, 2023)
- **South Korea** has developed disaster-resilient logistics systems tailored to extreme climate variability (OECD, 2023)

These models offer valuable insights for India's institutional and technological roadmap.

## 9. Strategic Recommendations: A New Playbook for India's Supply Chain Leadership

India stands at a defining moment. To lead in a world shaped by digital disruption, climate risk, and shifting geopolitics, India needs more than upgrades; it needs a bold new playbook. This means building supply chains that are digital by design, environment-resilient by necessity, and inclusive by intent.

The strategy is anchored around three core levers - Policy Leadership, Business Collaboration, and Innovation at the Grassroots, supported by a unifying national benchmark.

### A. Policy Leadership: A Common Operating Stack for Supply Chains

India's supply chain systems like ONDC, ULIP, and NLP need to work together as one, not in silos.

- **Create a National Supply Chain Systems Council (NSCSC):** A single, empowered body to align all major logistics and commerce platforms, define common standards (APIs, ESG metrics), and lead response efforts during disruptions.
- **Launch Sector-Based Resilience Ratings:** Just like credit ratings, introduce resilience scores for critical sectors—such as food, health, and clean energy—to assess their ability to bounce back from shocks like floods, pandemics, or global shortages.
- **Build a Shared ESG & Carbon Data Platform:** A simple, government-backed tool that helps companies, especially MSMEs, track and report their carbon footprint and sustainability performance without complex paperwork.

### B. Business Collaboration: Turning Competition into Shared Capability

Companies must move beyond optimizing for their own efficiency and start building shared infrastructure that benefits entire industries.

- **Industry Traceability Networks:** Firms in textiles,

agriculture, and electronics should jointly build traceability systems (e.g., blockchain) that help meet global sustainability norms and reduce compliance duplication.

- **Incentivize Green and Local Suppliers:** Adopt internal carbon pricing and reward sourcing from low-carbon, verified MSMEs, bringing environmental and economic inclusion together.
- **Collaborative Digital Twins:** Co-create digital simulation models that help predict risks like floods or logistics delays, especially for vulnerable sectors like rural supply chains, food distribution, and healthcare.

### C. Innovation at the Grassroots: Tech for Tier 2/3 India

Future-ready supply chains must be built where the need is greatest - India's smaller cities, rural regions, and informal economies.

- **Set Up a National Resilience Innovation Sandbox (NRIS):** A testbed where startups and research institutions can pilot technologies like AI, blockchain, and climate tools in real-world rural supply chains with government and CSR support.
- **Design Local ESG Scoring Models:** Create India-specific sustainability scores that reflect the realities of small enterprises like handloom weavers or tribal produce sellers instead of just importing Western standards.
- **Launch MSME Plug-and-Play Toolkits:** Build ultra-simple digital tools (e.g., WhatsApp checklists, QR traceability tags, voice-enabled ERPs) that help small businesses join platforms like ONDC in less than three days without needing IT support.

### D. National Scorecard: India's Supply Chain Sovereignty Index

Create an annual public index that tracks how states and sectors perform on three fronts:

- Digital readiness
- Sustainability maturity
- Resilience to disruptions

This scorecard can guide investment, improve transparency, and encourage healthy competition across India's economic landscape.

## 10. Conclusion

India's rise as a global supply chain leader will not come from replicating legacy models, but from reimagining systems that are smarter, greener, and more inclusive. At this pivotal juncture, the convergence of digital

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transformation, sustainability, and resilience presents a rare opportunity to architect value chains that are intelligent, climate-ready, and socially embedded.

With cohesive policies, robust institutions, and aligned stakeholder action, India has the potential not just to meet global standards, but to shape them. By championing regenerative, shock-resilient, and equitable supply networks, India can define the next frontier in global commerce.

“With digital innovation at its core, India is redefining supply chains to be smart, sustainable, and shock-proof, creating a new model of development for the Global South.”

— Panel Discussion Summary, IICA NCRBC 2025

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## 'WHY NATIONS FAIL OR SUCCEED': IMPORTANCE OF SOCIETAL INSTITUTIONS

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This year's Nobel Prize for Economics is shared by three economists Simon Johnson, Daron Acemoglu and James A Robinson. They bagged this coveted award for their research findings on how the quality of institutions in a country can lead it either down the path of economic prosperity or dismal poverty.

Before delving more into the fine points, it is interesting to note the background of instituting Nobel Prize for the subject Economics. Surprisingly, this is not a real Nobel award! Started in 1901, Alfred Nobel in his will wanted the awards to be given for Physics, Chemistry, Physiology, Peace and Literature only. Award for Economics was established by the Central Bank of Sweden (Sveriges Riksbank) in 1969, after 68 long years, rather than by the Nobel Committee itself. This fact is clearly mentioned even on the Nobel Prize website also, which states, "The prize in economic sciences is not a Nobel Prize." So contrary to all other Nobel prizes, the Nobel Prize in economics is called by the special name "Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel".

The first ever prize in economics was awarded in 1969 to Ragner Frisch and Jan Tinbergen "for having developed and applied dynamic models for the analysis of economic processes"

Now coming to this year's award, the winners studied on why nations fail or succeed. Their main emphasis was on the importance of societal institutions for a country's prosperity. Societies with a poor rule of law and exploitative institutions do not generate growth or change for the better.

Terms like "**Inclusive institutions**" (that provide equal rights and opportunities to all citizens and foster innovation and competition), "**Extractive institutions**" (that favour elites and limit competition, and create incentives for bribe seeking and corruption), "**Creative destruction**" (innovation and competition lead to the replacement of old technologies and businesses by new ones, and promote productivity gains and higher living standards), "**Critical junctures**" (Historical moments when the balance of power shifts and institutional change becomes possible), "**Political institutions**" (rules and norms that govern the exercise of power and authority, such as democracy, dictatorship, monarchy, or oligarchy) are widely used by the authors to drive their points.

In order to understand the matter better, we should know what these societal institutions mean?

A social institution is a group or organization that has specific roles, norms, and expectations, which functions to meet the social needs of society. They include the

family, government, religion, education, mass media and the economy. All these institutions have a great influence in making or breaking a nation, they argue.

**Family :** Family can be said as the most important social institution. We in India give a lot of importance to family values unlike western countries, inculcated from our age old traditions. Family is considered a "building block" of society as it is the primary unit through which socialization occurs.

Family is a social unit created by blood, marriage, or adoption. This can be a 'nuclear' one with only two parents and their children, or 'extended', including other relatives also. The nature of families may differ widely in the universe, all families, wherever they are or across cultures share certain common concerns in their everyday lives. The major mission is that the family socializes its members by teaching those values, beliefs, and norms. Emotional support and economic stability comes from families. Family acts as a caretaker for its members and caring and sharing principles are learnt from this basic institution.

Though the family has been the central social institutions, sociologists observe that other social institutions are slowly replacing them in providing key functions, the reason being family sizes are shrinking with more and more nuclear ones and close ties are becoming less effective. Modern schools have at least partially taken the role of socializing children, and along with that workplaces are playing a part.

**Education :** Education plays a vital role in the socialization of the younger generation. This is a continuous effort to impose on the child his habit of seeing, feeling and acting which are brought into him slowly and not arrived at spontaneously. The society, through education, provides its members with important knowledge, including basic facts, skills, norms and values. Education transmits cultural heritage from one generation to the next. It also provides people with the skills and knowledge they need to function in society.

I recall, during my earlier days, ethics, moral values, social behaviour etc were a part of our curriculum even at pre university levels, which are no longer there! Education, without doubt will help to reduce crime rates by providing people with alternatives to criminal activity.

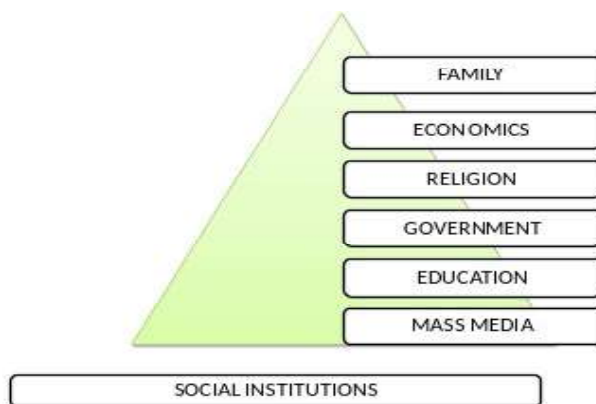
Education also has a number of latent, or hidden and unstated functions like fellowship, development of social networks, empowering the children to work in groups, and give political and social integration. Although every country in the world is capable of creating some form of education system, these systems, as well as the values and teaching philosophies of those

who run the systems, vary greatly.

It can be generally said that a country's wealth is directly proportional to the quality of its educational system. To cite an example, education can be seen as a luxury in poor countries that only the wealthy can afford, while in rich countries, education is more accessible to a wider range of people. This is because, in poorer countries, money needs to be spent on more pressing basic needs like food, shelter, clothing and no spare money available for investments in education. Luckily in India, the Constitution (Eighty-sixth Amendment) Act, 2002 provide free and compulsory education of all children in the age group of six to fourteen years as a Fundamental Right in such a manner as the State may, by law, determine.

**Religion :** Another social institution which plays a vital role in society is Religion. This is a structured system of beliefs and practices intended to fill the human need for meaning of their lives and a purpose for living. Apart from other tenets like believing in supernatural powers, relieving pressures, Religion can be used to instil moral values and socialize individuals into a community. Religion plays a significant role in shaping the way people view themselves and the world around them. It was here we learned what was right or wrong in the world, and how to communicate to others through language, appearance or actions through religious doctrine and beliefs. It can provide comfort and security to those in need. Large religions provide a basis for community support, charity work, establishing institutions of their own, like hospitals, schools, colleges, technical institutes, old age homes, de-addiction centres, skill development facilities etc.?

Religion plays a major role as a form of political control and a source of conflict. Max Weber has observed that religion could be a force for social change, while Ogburn says Religion is an attitude towards superhuman powers. Religion no doubt can instil moral values and socialize individuals into a community. It provides comfort and security to those in need.



**Government :** The next major social institution which plays a vital role in society is the Government of the country. It is responsible for maintaining order, protecting citizens from harm, and providing for the common good. The government does this through various Sub-institutions and agencies of the government such as the police, the military, and the courts are assigned to carry out this task. These legal institutions regulate society and prevent crime by enforcing laws and

policies. Social services, such as education and healthcare and ensuring the general welfare of a country's population is also part of good governance. Through government we learn of law and order, justice, and criminality, and repercussions of violating the written rules of the society.

Governance based on democracy or authoritarianism, makes the basis of shaping the distribution of power and resources. The Nobel laureates cite the examples of countries like Japan and Sweden as successful and 'inclusive growth providers' where all strata of society are included in the growth plan, while, Zimbabwe and Syria are examples of 'extractive institutions' which provides benefits to only a select few elite.

**Economy :** The production and distribution of goods and services are coming under this social institution. The Economy is also responsible for the exchange of money and other resources. The economy is often divided into three sectors: the primary sector, the secondary sector, and the tertiary sector. The primary sector comprises of all industries relating to the extraction and production of natural resources, like agriculture, forestry, fishing, and mining. The secondary sector has all industries that are concerned with the processing of raw materials into finished products, such as manufacturing and construction. The tertiary sector is the one having all industries providing services to individuals and businesses, such as education, healthcare, and tourism. We Supply Chain professionals can be proud that economic models for collaboration, competition, pricing, information symmetry, incentives etc aids to the proper economic growth of a nation.

**Mass Media :** Influence of mass media has become tremendous by the end of the 20th century. Television and movies have gathered speed with the phenomenal growth of Internet in recent times. Mass media is now becoming the dominant social institution, catering for the needs of society and educating its citizens. Post Covid- 19 environment has changed the entire communication, education and professional fields.

Easily accessed through technology, traditional social institutions of family, religion, government and education have become redundant in their former roles. Mediums like Whatsapp, Face Book, Instagram, Telegram etc have become the easy means of communication and interaction for direction in rules of behaviour and societal values.

**Conclusion :** The Nobel Laureates conclude that societies with a poor rule of law and institutions that exploit the population do not generate growth or change for the better. Countries with "Extractive Institutions" had resulted in a low economic growth, though they provide short- term gains for the people in power.

Wherever "Inclusive Institutions" were introduced especially in countries that were poor, the entire population became generally prosperous. Former colonies where Europeans once ruled have become rich at that time, but later on became poor and vice versa. For better "Inclusive" growth, we need to have effective supply chains.

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# INSIDE OUT: MASTERING INNER BANI FOR SCM EXCELLENCE

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**Introduction :** In an era where supply chains are being reshaped by digital disruption, climate shocks, and geopolitical shifts, professionals are not just navigating external volatility—they're wrestling with internal turbulence too. The BANI framework—Brittle, Anxious, Nonlinear, Incomprehensible—once used to describe chaotic business environments, is now a powerful lens to understand our inner emotional landscapes. Recent insights from the World Economic Forum's Future of Jobs Report 2025 indicate that emotional resilience and adaptability are among the top core skills expected to surge by 2030 (WEF, 2025). Similarly, NASSCOM's Future of Work 2024 report underscores learning agility and personal adaptability as key attributes for thriving in AI-augmented, high-pressure environments (NASSCOM, 2024). Whether managing erratic supplier behaviour or last-mile disruptions, inner instability can quietly derail performance. Imagine a procurement manager freezing mid-crisis due to anxiety—that's inner BANI at work. Mastering it from within isn't optional anymore; it's the new cornerstone of SCM excellence.

**Understanding Your Inner BANI :** While BANI was originally coined to describe unpredictable external environments, its elements deeply mirror our internal psychological states—especially for supply chain professionals constantly navigating high-stakes scenarios.

- Brittle reflects emotional fragility—cracking under pressure during sudden disruptions, like system outages or shipment delays.
- Anxious surfaces as chronic worry about outcomes, often impairing judgment during supplier renegotiations or cost escalations.
- Nonlinear emotions create unpredictable reactions, such as overconfidence one day and decision paralysis the next, impacting consistency in demand planning or stakeholder coordination.
- Incomprehensible refers to feeling overwhelmed when systems, data, or market shifts become too complex to process clearly—common during tech transitions like ERP upgrades or AI adoption.

Recognizing these patterns allows SCM professionals to catch emotional misalignments early, creating space for reflection and resilience amidst operational chaos.

**Impact of Inner BANI on SCM Performance:** Unmanaged inner BANI can quietly erode key competencies essential for supply chain success—such as decision-making, communication, collaboration, and problem-solving. For instance, anxiety may lead to poor communication during stockouts, resulting in delayed customer updates or misaligned team actions. Emotional brittleness can hamper supplier negotiations, where composure and clarity are critical. Nonlinear emotional states might cause inconsistent responses to similar challenges, confusing stakeholders and delaying resolution. When professionals feel overwhelmed (incomprehensible), they may avoid or delay critical analysis, risking missed signals in inventory trends or regulatory shifts. In a field

driven by precision and agility, these internal disruptions can cascade into costly inefficiencies and strained relationships across the supply chain.

**Strategies for Mastering Inner BANI :** To thrive in today's high-pressure supply chain roles, mastering inner BANI requires intentional self-leadership and emotional regulation. Here are actionable strategies:

- **Emotional Intelligence (EI)** - Cultivating EI helps professionals become more aware of their triggers and manage emotional reactions. Simple daily practices like pausing before responding, or empathetic listening in tense meetings, build relational harmony.
- **Mindfulness & Reflection** - Brief mindfulness exercises—such as Oxygen Advantage, deep breathing before high-stake negotiations or five-minute body scans—can reduce anxiety and restore clarity. Reflective journaling helps identify patterns behind brittle reactions or emotional fluctuations.
- **Resilience Building** - Embrace adaptability through scenario planning and accepting change as a constant. Building micro-habits, like celebrating small wins during supply chain disruptions, strengthens psychological endurance.
- **Learning Agility** - Engage in continuous learning—be it tech upskilling or leadership coaching—to prevent feelings of incomprehensibility. This boosts confidence and reduces overwhelm in dynamic environments.
- **Self-Awareness Tools** - Use self-check-ins or mental dashboards to track mood, stress, and focus. Apps like MoodMeter or Calm can support ongoing emotional hygiene.

Integrating these techniques into daily workflows not only stabilizes inner BANI but also enhances strategic thinking, collaboration, and leadership effectiveness across the supply chain.

**Connecting Inner Mastery to SCM Excellence :** When supply chain professionals cultivate inner mastery, they build emotional stability, sharpen decision-making, and foster empathetic collaboration—core traits for SCM excellence. Teams led by individuals grounded in self-awareness and resilience respond to disruptions with agility rather than panic. For instance, during a major port delay, a calm and mindful SCM leader maintained team morale and swiftly restructured distribution plans, minimizing losses. Such inner alignment empowers professionals to transform volatility into opportunity, enabling supply chains to become not only efficient—but truly adaptive, ethical, and future-ready.

**Conclusion :** In a Life 4.0 world marked by volatility and complexity, mastering inner BANI is no longer optional for supply chain professionals—it's foundational. Emotional clarity, resilience, and conscious action enable individuals to lead with purpose and build agile, value-driven supply chains. Inner transformation fosters outer excellence, proving that the journey to SCM success truly begins from within.

# HOW DIGITAL INNOVATION, GREEN PRACTICES, AND RISK RESILIENCE ARE SHAPING A SMARTER ECOSYSTEM AS A DRIVER OF THE FUTURE OF SUPPLY CHAIN SECTOR IN INDIA

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**Introduction :** The supply chain sector is a vital part of the Indian economy. It connects manufacturers, transporters, retailers, and digital platforms to meet growing consumer needs. This sector not only drives trade within the country but also helps India take part in global markets. Today, companies want more than just speed and profit. They are also focusing on sustainability and resilience. This has made supply chains the center of major changes.

New digital tools like AI, IoT, and blockchain are making supply chains smarter and faster. Green steps like using electric vehicles and tracking carbon help protect the environment. After the Covid 19 crisis, there is also a strong need to make supply chains more resilient.

Government programs like PM Gati Shakti, ONDC, and NLP are helping this change. They aim to lower costs and improve digital systems. This study will explore digital change, green practices, resilience, and policy support in supply chain sector of India.

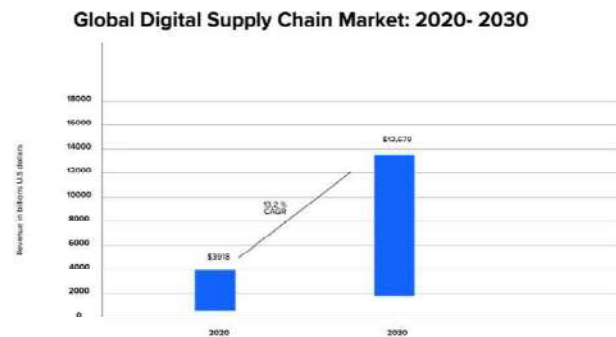
## 2. Digital Transformation in Indian Supply Chains

| Aspect             | Traditional Supply Chain                                                                    | Digital Supply Chain                                                                                            |
|--------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Operation          | Relies on historical data and past transactions for process management.                     | Functions in real-time, using current data to make immediate decisions.                                         |
| Structure          | Follows a linear path from suppliers to consumers with a series of sequential steps.        | Employs a networked model with interconnected systems and multiple points.                                      |
| System Integration | Often operates with separate, standalone systems that have limited interconnectivity.       | Features integrated IT and operational technology systems for smooth data exchange.                             |
| Problem Detection  | Depends on manual efforts to spot issues and forecast potential risks.                      | Uses integrated data to predict problems and take preventive actions proactively.                               |
| Decision-Making    | Decisions are mainly made by humans based on information from various machines and reports. | Driven by automated systems and algorithms, with human oversight for final decisions and strategic adjustments. |

**Table 1: Traditional Supply Chain Vs. Digital Supply Chain**

(Source: Singh, 2025)

The Table 1 clarifies the difference between the traditional and digitalized Supply Chain Management (SCM). From there, it can be deduced that the traditional SCM is becoming obsolete due to its limited applicability. Hence, the organizations in this sector are moving towards the digitalization of the process.



**Figure 1: Global Digital Supply Chain Market 2020-20230**

(Source: Singh, 2025)

According to Allied Market Research it has been identified that the overall supply chain market is growing over 13% CAGR by which the market value is going to be of around \$3918 million by the end of 2030 (Singh, 2025). This huge market scope is also a driver for the organizations in thriving for making the process of SCM digitalized.

### 2.1. Key Technologies Transforming the Landscape

Digital transformation in Indian supply chains is growing fast considering the rapid growth in global supply chain sector. It is powered by new technologies that improve visibility and speed. Artificial Intelligence and Machine Learning help in demand planning (Singh, 2023). These tools use real-time data like sales, weather, and festivals. Companies like Dabur use AI to reduce stockouts and manage inventory better (Waditwar, 2025).

On the other hand, Internet of Things and RFID improve tracking. In pharma and food sectors, IoT helps maintain cold chain standards. Godrej Appliances uses IoT to cut losses and improve delivery. RFID tags help track items in retail, where stock variety is high (Chaturvedi, Goyal and Dwivedi, 2024). Automation is also helping in warehouses to improve speed and reduce errors.

Blockchain is still new but shows promise. NITI Aayog tested it in Andhra Pradesh to trace farm produce. It helped farmers get better prices. In pharma and textiles, it can help fight fake products. Cloud ERP systems like Zoho and SAP help small businesses (Narain, 2022). Startups like Jumbotail use them to link kirana stores to supply chains.

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## 2.2. Case Studies & Examples

Indian corporates and institutions are leveraging digital tools not merely for optimization but for strategic transformation. Reliance Retail has implemented an AI-powered inventory system that connects POS data with central warehouses. This system enables real-time auto-replenishment, enhancing in-store availability while minimizing excess inventory. It is being a critical advantage in the fast-moving consumer goods (FMCG) sector (Sharma, 2023).

Tata Steel, on the other hand, has exemplified digital leadership in core manufacturing. It uses Industrial IoT to implement predictive maintenance across high-capital machinery (Roy, 2025). Through sensor data analytics, the company has been able to anticipate equipment failure, reduce unplanned downtime, and improve energy efficiency. These all are aligned with its broader ESG strategy. Tata's foray into AI-driven process optimization and digital twins marks a shift from reactive to proactive operations management.

## 2.3. Impact and Benefits

The impact of digital transformation in supply chains is visible across multiple dimensions. Real-time visibility provided by IoT and cloud tools is empowering organizations to anticipate disruptions, respond rapidly, and reduce systemic inefficiencies. During COVID-19, companies with digital maturity demonstrated superior agility, pivoting to alternate sourcing, managing workforce shortages, and responding to demand shocks (Mubarik and Khan, 2024). Furthermore, digitalization is enabling leaner working capital models by improving inventory turnover and reducing wastage.

Sustainability has emerged as an unintended but welcome consequence. Tools like AI-driven route optimization and real-time energy monitoring are reducing fuel consumption, emissions, and resource wastage (Vasudevan, 2024). Companies are also beginning to use digital platforms to track Scope 3 emissions across their value chains, marking a departure from siloed environmental compliance toward integrated ESG strategy.

## 3. Sustainability in Supply Chain

### 3.1 Drivers for Green Supply Chains

The regulatory environment, especially the implementation of Extended Producer Responsibility (EPR) standards, is one of the main factors promoting sustainability in Indian supply chains. Post-consumer plastic waste management is the responsibility of manufacturers, importers, and brand owners, according to the Amended Plastic Waste Management Rules (2022). This includes measurable goals for packaging material co-processing, recycling, or reuse. Concurrently,

comparable EPR frameworks in the battery and e-waste industries are pressuring manufacturers to implement tracking technologies, work with approved recyclers, and construct reverse logistics systems in order to guarantee transparent waste handling (Sahu et al. 2022). These rules are becoming more and more like design limitations that influence logistics planning, vendor selection, and product life cycles rather than merely being compliance checkboxes.

Supply chain expectations are being redefined by corporate ESG (Environmental, Social, and Governance) commitments in conjunction with regulatory pressure. Prominent companies like Godrej, ITC, and Mahindra & Mahindra have set high ESG targets, such as water stewardship, supply chain decarbonization, and zero waste goals (Gupta and Singh, 2024). Suppliers and logistics partners are now expected to adhere to sustainability KPIs (energy consumption, packaging recyclability, and emissions intensity) as a result of these initiatives. ESG ratings, which connect sustainability with observable business value, are also increasingly being used to win over investors and obtain preferential financing.

Consumer awareness is another important factor that is accelerating the green transformation. When making purchases, Indian Gen Z and millennial consumers are starting to place a greater emphasis on sustainability. Consequently, supply chains are being restructured to meet evolving needs. 57% of consumers think about a product's sustainability impact before making a purchase, according to a 2023 Deloitte India survey (Gupta et al. 2024). Consumer awareness is causing procurement policies to change, and companies are spending more on open environmental reporting, traceability, and ethical sourcing in order to boost their brand and gain a competitive advantage.

### 3.2 Green Practices Being Adopted

Thanks to several innovative initiatives, India's transition to green supply chains is beginning to take shape. One prominent example is the increasing use of electric vehicles (EVs) for last-mile delivery. Companies like Amazon India and Flipkart are setting the standard; Amazon has committed to deploying 10,000 EVs by 2025, while Flipkart wants to have a fully electric fleet by 2030. Since they use less fuel and need less maintenance, particular initiatives are not limited to sustainability. Initiatives also result in financial savings over the vehicle's lifetime (Gupta et al. 2022). For example, Startups like Euler Motors and Magenta Mobility are making a big contribution to this shift by offering scalable EV leasing models. They are also expanding the charging infrastructure, especially in Tier 1 and Tier 2 cities.

Additionally, it can be identified that the application of reverse logistics and circular economy is able to reduce

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the environmental impact of materials, along with providing economic value. Tech giants such as Apple and Samsung implemented structured electronics return programs in India that offer incentives for devices that are returned (Chhabra and Kr Singh, 2024). Collecting and recycling more packaging than they produce helps Unilever and Nestlé India to make themselves plastic neutral. Similarly, the circular economy model is also gaining popularity in the apparel industry, as companies such as “FabIndia” are investing in sustainable textiles and recycled clothing lines.

Green transformation can be accomplished by utilizing software to track carbon footprints. Current technologies are allowing companies to track Scope 1, 2, and 3 emissions across their entire supply chain using digital platforms. This helps them in making data-driven decisions. For example, Infosys is employing internal dashboards that collect emissions data from suppliers, logistics partners, and operational sites. On the other hand, businesses such as TCS and Accenture India are putting life-cycle assessment tools into place to assist clients in manufacturing. In the case of retail sectors, business are using emissions reporting and science-based target alignment to maintain their sustainability quality. Filling the gap between sustainability intentions and quantifiable effects, digital technologies are increasing accountability.

### 3.3 Data & Reports

Empirical evidence that India’s economy needs to maintain sustainability in its operation. This is essential to ensure that the supply chain process is following the global needs. According to the NITI Aayog report, “Decarbonizing Transport in India (2022)”, there are two strategies to lower emissions. The first strategy to encourage emissions is multi-modal transportation. The second strategy is to electrify significant freight corridors so that they produce less carbon and greenhouse gases (Kalkha et al. 2023). According to the World Economic Forum’s Global Logistics Emissions Index (2023), India is ranked 23rd. The rank indicates a lack of coordinated cross-sectoral action in the Indian logistics sector, even though it has sufficient clean mobility infrastructure. Currently, the logistics sector accounts for nearly 14% of India’s carbon emissions. It has also been predicted that this percentage could double by 2040 if nothing is done, according to a 2022 report from TERI (The Energy and Resources Institute). This shows that the Indian logistics sector needs to take faster and coordinated action to improve sustainability. For example, it can improve warehousing, trucking and packaging efficiency.

## 4. Building Supply Chain Resilience

### 4.1. Need for Resilience

Multiple supply chain shocks happening for the past few years have exposed distinct weaknesses existing in

India’s industrial and economic structure. Numerous industries shut down as a result of the pandemic’s disruptions to labor availability, manufacturing output, and cross-border travel. Delivery delays took place due to the result of logistics bottleneck situations appearing in port areas (Gupta and Singh, 2021). For example, port congestion and container shortages occurred due to a shift in the economy during the pandemic. The over-reliance on the Suez Canal was exposed in 2021 as the Suez Canal crisis occurred. The conflict between Russia and Ukraine also had a significant effect on the supply chain process of goods like natural gas, fertilizer, and sunflower oil. This led to shortages and price volatility throughout the Indian economy

The lack of semiconductors was arguably the clearest illustration of India’s structural reliance. Months of delays were experienced by industries such as consumer electronics, smartphones, and automobiles due to the unavailability of critical chip components (Moldabekova et al. 2021). Furthermore, India’s pharmaceutical industry, which prides itself on being the “pharmacy of the world,” faced danger due to its excessive reliance on Chinese Active Pharmaceutical Ingredients (APIs). These intensified disruptions compelled public and private stakeholders to reconsider long-held assumptions about globalization, efficiency, and supply base concentration.

### 4.2. Strategies for Resilience

India is trying to build strategic resilience against a high-risk environment. Indian companies and policymakers are putting more emphasis on proactive resilience-building techniques that prioritize flexibility, redundancy, and visibility.

The trend of supplier diversification is one of the most prominent in the Indian economy. Indian companies, engaged in electronics, chemical, and apparel sectors, are reducing their over-reliance on China with greater priority. The business is applying the “China+1” strategy into practice. Business are choosing Bangladesh, Vietnam, Thailand, and Indonesia and alternative suppliers (Wan et al. 2022). There is also support for the Indian economy to engage domestic vendors to increase local capacity. This helps in reducing exposure to geopolitical uncertainties. Although this diversification entails higher transaction costs and new relationship-building activities, it protects against supply shocks.

Localization is growing in popularity as companies recognise the benefits of both control and agility. Industries such as food processing, pharmaceuticals, and auto manufacturing are sourcing domestic materials (Deo and Anjankar, 2023). Another example is here, where the business expanded its local sourcing footprint to ensure just-in-time assembly and guard against import volatility. Similarly, the expansion of Indian contract

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electronics producers (such as Dixon Technologies and Optiplus) is a sign that Indian suppliers are expanding their capability to support growing demand.

Technological forecast is another aspect of modern risk management. Business are applying AI risk management tools to simulate the supply chain. Similarly, the Indian government is advancing an integrated, multi-modal logistics ecosystem that links rail, road, waterways, and air cargo infrastructure under the PM Gati Shakti initiative. This is making the transportation process flexible.

#### 4.3. Critical Observations

##### Resilience vs. Cost-Efficiency:

The main issue with resilience-focused models is the possibility of degradation of cost-efficiency. Higher inventory buffers, multi-location warehousing, and redundant suppliers frequently lead to higher operating costs for business. These measures may be too costly for Indian MSMEs with narrow profit margins and operating in a competitive market. There is also a need for conflict resilience and the ideas of lean management and cost optimization.

##### PLI as a Resilience Enabler:

The Indian government's Production-Linked Incentive (PLI) program has been instrumental in fostering domestic production in key strategic sectors like semiconductors, mobile devices, electric vehicles, and pharmaceuticals. With the help of incentives for capacity building, technological advancements, and local value addition, the PLI program is increasing domestic capabilities (Gupta and Singh, 2024). This also helps in reducing dependency on imports. For example, companies like Vedanta-Foxconn and Tata Electronics are setting up semiconductor fabrication plants that, once operational, could significantly lower the risk involved in India's electronics and automotive supply chains.

##### National Logistics Policy (NLP) 2022:

The NLP, which was introduced in 2022, aims to reduce India's logistics costs from an incredible 13–14% of GDP to 8% (Ministry of Commerce & Industry, 2023). It created the foundation for a unified logistics interface platform, shared digital documentation, and specialized logistics parks in India. The advantages of such infrastructure go beyond efficiency (Wan et al. 2022). They directly promote resilience by ensuring the traceability, transparency, and modularity of transport systems. A resilient supply chain requires a strong national logistics backbone, which the NLP promises to provide in the years to come.

#### 5. Integration of Digital Green and Resilient Approaches

##### 5.1. Systems Thinking: Synergies

Digital technologies like AI, IoT, and blockchain are increasingly powering supply chains. It is happening not just for efficiency, for advancing sustainability and resilience as well. AI-driven dashboards now track emissions in real time, while blockchain ensures supplier traceability. Hence, it can be stated that it is enabling ethical sourcing and compliance. These tools also help in identify vulnerabilities (Example: unstable Tier-2 suppliers) allowing firms to preempt disruptions through data-driven risk assessments.

Green practices further enhance resilience. The electrification of fleets and adoption of renewable-powered warehouses reduce reliance on volatile fossil fuel markets. Additionally, it is offering both environmental and operational benefits. Digital twins simulate crises and interventions, helping optimize carbon, cost, and continuity in a unified framework.

##### 5.2. Example Ecosystems

Several Indian companies have emerged as early adopters of this triadic approach and those are being enumerated below.

One such case is **Marico**, which has digitized its agricultural sourcing networks, particularly for coconut and safflower oil. By incorporating smallholder farmers into mobile-based platforms, Marico ensures traceable sourcing, provides real-time agronomic advice, and tracks soil health parameters. These digital tools help farmers and support Marico in achieving low-emission and regenerative farming goals. This makes the supply chain more eco-friendly and less affected by climate and crop risks (Rahaman, 2023).

**Delhivery** is another good example. It uses AI to plan better delivery routes and reduce fuel use. The company also uses electric vehicles and eco-friendly packaging. This helps reduce traffic delays and fuel problems. Delhivery shows how green logistics and smart technology can work well together and grow at scale (Global Business Line, 2024).

##### 5.3. Frameworks to Assess Impact

Companies in the Indian supply chain sector are now using clear frameworks to make sure digital, green, and resilient efforts are real and effective. The Triple Bottom Line or TBL is a common tool. It looks at profit, people, and the planet together (ITC, 2024). This helps companies balance financial goals with social and environmental impact. Indian firms like Tata Power and ITC use TBL in reports and planning to show their broader responsibility.

Some businesses also use Supply Chain Maturity Models. These check areas like vendor ethics, emissions, and risk planning. Standards like ISO 20400 and ISO 22301 guide firms toward global best practices (Crask, 2024).

#### 6. Challenges and Critique

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India has made strong progress in building digital and sustainable supply chains. However, many structural challenges still remain. One major issue is the exclusion of MSMEs. These small businesses make up more than 90% of the supply network. Only 12% of MSMEs are currently fully digitized. Even as 76% plan to invest more in cybersecurity and 72% in cloud technologies highlighting financial and advisory constraints among smaller firms (Economic Times, 2025). Yet, they often lack money, digital skills, and basic tech tools. Large companies are moving fast with AI, IoT, and blockchain. But many small firms still use outdated systems. Government programs like Digital MSME exist. Some private platforms also offer support. But old habits and unclear benefits slow down adoption.

Cybersecurity is another big problem as supply chains use more cloud systems, APIs, and smart devices, the risk of cyberattacks increases (Kumar and Mallipeddi, 2022). The ransomware attack on Jawaharlal Nehru Port Trust in 2020 showed how serious this threat can be. Many small firms do not have proper firewalls or security plans. This leaves the whole network open to risk.

There is also a lack of skilled people. Workers often do not have the right mix of supply chain and tech knowledge. Colleges are adding new courses. But the number of trained professionals is still too low.

Going green is also expensive. EVs, solar-powered sites, and eco-friendly packaging all cost a lot. The payback time is long. Small companies face the most difficulty. They do not have easy access to green loans or subsidies. The supply of green materials is also low and often uncertified. This makes ESG reporting hard (Chen et al. 2022).

## 7. Policy & Institutional Support

### 7.1. Key Government Initiatives

The Indian government plays a key role in shaping supply chains that are digital, green, and resilient. To solve old problems and build future-ready systems, it has launched several important programs in recent years.

One of the biggest efforts is PM Gati Shakti. This is a digital platform that aims to connect transport planning across different ministries and states. It helps reduce delays, improve last-mile delivery, and remove coordination issues (Economic Times, 2025). As a result, supply chains become faster, cheaper, and more reliable.

Another major step is the Open Network for Digital Commerce, or ONDC. This platform gives small businesses a chance to join online markets without depending on big e-commerce companies (Economic Times, 2025). It builds a fair, open, and flexible retail supply chain. It also helps small firms become more visible and stronger against market changes.

The government has also introduced Production-Linked Incentive schemes, or PLIs. These focus on sectors like electronics, textiles, and medicines. The aim is to boost local production and reduce imports. These incentives help India grow into a global supply chain hub, especially in high-tech areas (Wandhe, 2024).

The National Logistics Policy, launched in 2022, is another key move. It tries to lower logistics costs and increase speed and transparency (AVR Logistics, 2025). It uses digital tools like ULIP for real-time tracking. This improves both sustainability and risk management.

Finally, the National Green Hydrogen Mission will change how freight moves in the long term. Hydrogen-powered trucks and trains will help cut pollution in transport. This mission supports both green goals and energy security (Ministry of New & Renewable Energy, 2023).

### 7.2. Institutional Collaborations

Beyond government intervention, **industry bodies and professional institutions** are instrumental in bridging the gap between policy formulation and execution. Organizations like **FICCI** and **CII** have taken on active roles in supply chain reform (KPMG International, 2021). Through ESG advisory panels, climate disclosure tools, and skill development workshops, these bodies are helping companies align with sustainability norms and operational resilience.

At the professional level, the **Indian Institute of Materials Management (IIMM)** stands out as a leading institution for building supply chain capabilities. This institute is conducting certifications, capacity-building programs, and publishing domain-specific research. Additionally, it is raising the professional standards of procurement and logistics functions across both public and private sectors (IIMM, 2025). It also acts as a critical knowledge partner for MSMEs navigating global ESG frameworks and digitization challenges.

In the digital domain, **NASSCOM** is actively shaping the future of tech-integrated supply chains. It is promoting AI/IoT applications in procurement and logistics, supporting digital innovation hubs, and advocating for IT upskilling. It is also laying the foundation for a tech-enabled, disruption-resilient supply network (NASSCOM, 2025).

### 7.3. Future Expectations

India is preparing for a future where digital, green, and resilient supply chains become the norm. One new idea is AI-powered logistics parks. These parks will use smart systems, sensors, and real-time data to manage goods. They will cut costs, save time, and help during disruptions by predicting problems and adjusting routes quickly (Times of India, 2025).

Another big step is the National Carbon Credit Exchange. This will let companies earn money by cutting carbon emissions. If a company uses clean energy or green transport, it can sell its savings. This will turn sustainability into a business advantage and make green practices more common (Press Information Bureau, 2025).

## 8. Conclusion & Way Forward

As the Indian Supply Chain is evolving to meet the demands of a dynamic global economy, the integration of digital transformation, sustainability, and resilience is a strategic imperative. These pillars, once pursued in isolation, must now converge into a unified operational framework to ensure long-term competitiveness, regulatory compliance, and stakeholder trust.

Digital technologies (AI, IoT, and blockchain etc) are not merely tools for automation but enablers of visibility, intelligence, and responsiveness across the supply chain. Simultaneously, sustainability must move beyond compliance and embrace circularity, resource optimization, and emissions reduction as core design principles. Resilience, once viewed as a cost-heavy insurance measure, has proven essential in navigating disruptions like the COVID-19 pandemic, geopolitical conflicts, and raw material shortages.

Young professionals have a pivotal role to play in this transformation. As digital natives, they are best positioned to lead innovations in AI-driven logistics, ESG analytics, and sustainable procurement. Policymakers must continue enabling reform through infrastructure development, transparent regulations, and targeted incentives. Likewise, technology providers must create scalable, inclusive tools that support not only large enterprises but also vast network of Indian MSMEs.

Hence, it can be concluded that the most successful supply chains will be those that embed intelligence, sustainability, and resilience at their core. This strategic convergence offers not just operational advantages but also the opportunity to build a more equitable, efficient, and environmentally conscious economic future, transforming India into a global leader in next-generation supply chain systems.

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# WINNING WITH COMPETITIVE ADVANTAGE - THE PATH TO BUSINESS SUCCESS: DRIVING GROWTH AND MARKET LEADERSHIP

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**Introduction :** Competitive advantage refers to the Unique Attributes, Qualities, Resources, or Strategies that allow an organization to outperform its competitors in the market. It provides an edge that enables the organization to attract customers, generate higher sales, and achieve sustained profitability.

Competitive advantage benefits an organization by differentiating it in the market, increasing market share, increased customer demand, enabling premium pricing, fostering customer loyalty, creating barriers to entry, building brand reputation, driving operational efficiency, improved profitability, innovation, and the ability to attract top talent and supporting sustainable growth. It positions the organization for long-term success and profitability in a competitive business environment by creating a sustainable and unique position in the market. There are several potential sources of competitive advantage that businesses can leverage to achieve success.

## The Power of Competitive Advantage

A strong competitive advantage is the foundation of long-term success. It's the force that draws customers to you, drives your sales, and secures sustained profitability. This unique edge allows you to:

- **Stand out in the market** and attract a larger share of customers.
- **Command premium pricing** because what you offer is truly special.
- **Build deep customer loyalty** that keeps people coming back.
- **Create barriers to entry** for would-be competitors.
- **Forge an unstoppable brand reputation** that resonates with everyone.

This advantage isn't a one-time win; it's a continuous journey. It drives operational efficiency, fuels innovation, and allows you to attract and keep the very best talent. It positions your organization for enduring success.

**"Competitive edge is the engine; success is the journey".**

**The Heart of Success :** Every business that's made a mark on the world has leveraged its unique strengths to create an undeniable advantage. This isn't something you stumble upon by chance. **Winning isn't luck—it's leverage built on advantage.**

When you focus on what makes you unique—your people, your processes, your product, your capability, your competency—you unlock a powerful chain reaction. That single, unique attribute sets off a ripple effect of growth and success that lasts for generations.

**Advantage Ignites Growth, Success Sustains Legacy.**

**Sources of Competitive Advantage**

**"Competitive Advantage: Your Edge for Today, Your Legacy for Tomorrow."**

What sets a business on a path to greatness?

- ✓ It's not just about what you sell, but how you sell it.
- ✓ It's not just about what you sell, but how you solve problems and how you build trust with every client.
- ✓ It's not just about your products, but how you connect with your customers and how you solve their biggest challenges.
- ✓ It's not just about your technology, but how you use it to create seamless experiences and lasting relationships.
- ✓ It's not just about your size, but how you demonstrate agility, how you foster innovation, and how you earn trust in every interaction.

This is the true power of competitive advantage — **a unique blend of resources, strategies, innovation, culture, customer trust, resilience, and capabilities** that doesn't just help a company compete, but empowers it to lead, shape, and dominate its market.

Your advantage isn't accidental—it's **built on strategy, innovation, operational excellence, brand reputation, adoption of advanced technology, supply chain mastery, superior quality, unique resources, and the unique value** you provide that sets you apart. **"Stand Out by Design, Not by Chance."** Your deliberate choices inspire trust, loyalty, and preference—**"Where Strategy Meets Irresistible Value."** In a crowded market, you don't just compete, you lead: **"Advantage Engineered, Success Assured."**

Sources of competitive advantage are the unique strengths—whether in capabilities, resources, innovation, brand equity, customer relationships, cost leadership, or differentiated offerings—that empower a company to consistently outperform competitors. They create a distinctive market edge that is hard to imitate or replicate, enabling not just short-term wins but long-term resilience, profitability, and leadership. A truly sustainable competitive advantage goes beyond efficiency; it ensures customer loyalty, adaptability to change, and strategic relevance in an evolving business landscape. Companies can leverage competitive advantage from multiple sources, the most common being:



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Let's now study each of them with examples.

**Cost Leadership: "Efficiency isn't just about cutting costs—it's about smart resource allocation and operational mastery that lets you offer unbeatable value while maintaining healthy margins."**

Cost leadership is a strategic advantage achieved not by simple budget cuts, but by a masterful approach to operational excellence. It's the art of creating superior value through offering products or services at a lower cost than competitors while maintaining acceptable quality. By systematically minimizing production costs, streamlining every process, and leveraging economies of scale, organizations can unlock powerful, sustainable advantages that competitors find difficult to replicate. This strategy's core is the ability to deliver uncompromising quality at prices that are simply unbeatable. When an organization is fully committed to this level of operational discipline, it transforms traditional constraints into limitless opportunities for market dominance and growth. It proves that a focus on **"Lean costs"** can indeed lead to **"limitless possibilities."**

**Examples:** Maruti Suzuki, an Indian automobile manufacturer, has established cost leadership in the Indian market. The company's focus on operational efficiency, economies of scale, and localization of production processes has allowed it to offer vehicles at competitive prices. Maruti Suzuki's extensive distribution network and strong after-sales service support further contribute to its cost leadership advantage in the Indian automotive industry.

Some more Examples are Walmart is known for its low-cost leadership by leveraging efficient supply chain management, cost-effective operations, bulk purchasing power its and ability to offer low prices to customers.

Southwest Airlines, an American low-cost carrier, has established itself as a cost leader in the aviation industry. The airline focuses on minimizing operational costs through efficient processes, high aircraft utilization, and streamlined operations. IKEA, a Swedish multinational furniture retailer, is known for its cost leadership approach. The company designs its products for efficient production, utilizes flat-packaging for cost-effective transportation, and encourages customers to self-assemble furniture, reducing labor costs.

**Differentiation: "Standing out isn't about being different for the sake of it—it's about creating unique value that customers can't find anywhere else and are willing to pay premium prices to get."**

**Differentiation is the art of standing apart by delivering what others cannot.** Whether through unique features, superior quality, or innovative design, it elevates market positioning and builds stronger customer preference. "Be different, be desired." By offering distinctive value, organizations inspire loyalty and command premium recognition—"Innovation that speaks, quality that lasts." In a crowded market, true leaders rise by redefining standards—"Stand unique, lead unmatched."

**Examples:** Amul, an Indian dairy cooperative, has differentiated itself through its "Amul Girl" mascot, catchy advertising campaigns – Amul Doodh Peeta hi India, and the tagline "The Taste of India". Amul's focus on high-quality dairy products, a vast product portfolio, and a robust distribution network have helped it build a strong brand with a loyal customer base.

Titan, an Indian consumer goods company, has differentiated itself in the watch industry through design, innovation, and brand positioning. The company offers

a wide range of watches with unique designs, cutting-edge technology, and a mix of affordable and premium offerings. Other Examples are Apple Incorporation, known for its differentiated products and user experience, such as the iPhone and MacBook.

LEGO, a Danish toy company, has differentiated itself through its iconic interlocking building blocks and focus on creativity and imagination. LEGO's emphasis on quality, innovation, and engaging play experiences has made it a beloved and trusted brand worldwide.

Nike, an American sportswear and athletic footwear company, differentiates itself through product innovation, cutting-edge technology, and brand positioning. Nike's differentiation strategy, combined with its strong brand image, gives it a competitive advantage over its rivals.

**Technological Innovations & Intellectual Property Rights & Patents: "Innovation today becomes your competitive moat tomorrow." "Technology isn't just a tool—it's your blueprint for market dominance." "Smart innovation creates tomorrow's industry standards today."**

Developing cutting-edge technologies or products. Competitive advantage often stimulates innovation and encourages organizations to continuously improve and develop new products, services, or business models.

**Examples:** Tesla, known for its innovative electric vehicles and advancements in autonomous driving technology.

Legal protection turns your ideas into exclusive market advantages."

"Patents don't just protect ideas—they weaponize them against competition." "Intellectual property: where creativity meets competitive fortress."

**Intellectual Property Rights & Patents are powerful sources of competitive advantage**—they safeguard unique ideas, inventions, and designs, ensuring exclusivity and protecting against imitation. By securing patents, trademarks, and copyrights, organizations not only protect their innovations but also monetize creativity through licensing, royalties, or strategic partnerships. **"Own the idea, rule the market."** Strong IP portfolios enhance investor confidence, strengthen brand credibility, and create legal barriers that competitors struggle to cross. "Protected innovation, unstoppable growth".

**Example:** Pfizer, which holds patents for drugs like Viagra and Lipitor, providing them with exclusivity in the market.

**Strong Financial Position:**

**"Financial strength isn't just about having money—it's about having the freedom to act when opportunities arise and competitors can't."**

A strong financial position having robust financial resources and stability can indeed be a significant competitive advantage for a business. It provides the company with the ability to maneuver and take advantage of opportunities that may not be accessible to financially weaker competitors.

"A strong balance sheet is your competitive insurance policy and growth accelerator rolled into one."

**Examples:** Berkshire Hathaway, a conglomerate led by Warren Buffett, known for its financial strength and diverse portfolio of investments.

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Reliance Industries Limited (RIL) exemplifies how financial strength drives competitive advantage in India. As one of the nation's largest conglomerates, RIL has diversified into petrochemicals, refining, energy, retail, telecom, and digital services. Its robust finances enabled bold investments and large-scale expansions, while visionary leadership, strategic decisions, and customer focus cemented its dominance across industries.

### **Strong Brand Equity & Reputation:**

**"Your brand isn't just recognition—it's the premium customers willingly pay for the promise you consistently deliver."**

Strong brand equity and reputation are powerful sources of competitive advantage. Brand equity reflects the value and perception customers attach to a brand, while reputation shapes how stakeholders—customers, employees, investors, and the public—view the company. Together, they drive trust and loyalty, price premium, market share growth, talent attraction, strategic partnerships, brand diversification, crisis resilience, and formidable entry barriers, making the brand a lasting differentiator in competitive markets.

**"Brand equity turns marketing into momentum and trust into sustainable profits."**

**Examples:** Coca-Cola, a globally recognized brand with a long-standing reputation for quality beverages.

Another example, Tata Group is a multinational conglomerate with a diverse portfolio of businesses, including Tata Motors, Tata Steel, Tata Consultancy Services (TCS), Tata Power, and more. The Tata brand as a trusted and preferred choice in the Indian market is known for its integrity, social responsibility, and commitment to quality, which has resulted in a strong brand equity and reputation.

### **Strategic Engagements - Networks & Distribution Channels:**

**"Your network isn't just who you know—it's the strategic pathways that multiply your market reach and accelerate growth."**

Strategic engagements with networks and distribution channels can indeed lead to a competitive advantage for companies. These engagements involve forming partnerships, collaborations, or utilizing existing distribution networks to enhance market reach, increase sales, and create unique value propositions.

**Examples:** Amazon, which has a vast network of sellers, warehouses, and a reliable logistics system, providing them with a competitive advantage in e-commerce.

Coca-Cola has established a powerful distribution network that spans across the globe. The company has partnerships with numerous bottling companies, ensuring that its products are widely available in nearly every corner of the world. This extensive distribution network has been a key factor in Coca-Cola's ability to maintain its position as one of the world's most recognized and valuable brands in the beverage industry.

**"Strategic partnerships turn individual strengths into collective dominance across multiple markets."**

**Suppliers and Customer Relationships** are vital pillars of Strategic Engagement. Strong supplier partnerships ensure reliability, quality, and cost efficiency, while a loyal customer base drives sustained demand, trust, and advocacy. Together, they create a mutually reinforcing advantage that enhances resilience, reduces

risks, and strengthens long-term competitiveness in the market.

**Example:** Nike, which maintains strategic partnerships with suppliers for high-quality materials, and has a dedicated customer following for its athletic footwear and apparel.

Procter & Gamble (P&G), a multinational consumer goods company, has effectively utilized a network of retail partners, including supermarkets, drugstores, and convenience stores, to distribute its extensive product portfolio. The company's wide-ranging product availability and strong brand recognition have contributed to its competitive advantage in the fast-moving consumer goods industry.

### **Operational Excellence, Agility & Speed to Market:**

**"Excellence isn't perfection—it's the relentless pursuit of doing things faster, better, and more efficiently than anyone else can match."**

Efficient processes, adaptability, and fast product/service delivery. Example: Toyota, known for its lean manufacturing principles, enabling them to achieve operational efficiency and quick response to market demands.

**"Agility turns market changes from threats into opportunities while competitors are still figuring out what happened."**

Agility also creates a competitive advantage to an organization's ability to respond quickly and effectively to changing market conditions, customer demands, and competitive pressures.

**"Speed to market isn't just about being first—it's about capturing value before competition even arrives."**

**Examples:** Flipkart, an Indian e-commerce company, has demonstrated agility as a competitive advantage in the highly dynamic and competitive e-commerce market. It quickly adapted its business model, supply chain, and technology infrastructure to meet changing customer expectations and market demands. Similarly, Zara, a Spanish fashion retailer, is known for its agility in the fast-fashion industry worldwide; Netflix, an American streaming service, has leveraged agility as a competitive advantage in the entertainment industry.

### **Risk & Resilience**

**"Resilience isn't just surviving storms—it's building the strength to thrive when others are merely trying to weather them."**

Risk management and organizational resilience are powerful sources of competitive advantage. By anticipating uncertainties, adapting to disruptions, and responding effectively to crises, companies not only protect performance but also gain stability, stakeholder confidence, and long-term sustainability—outperforming competitors who lack such preparedness.

**"True resilience means bouncing back stronger, not just bouncing back."**

**Examples:** Mahindra & Mahindra (M&M) showcases how resilience and risk management fuel competitive advantage. With a diversified portfolio spanning automobiles, tractors, and mobility solutions, M&M has successfully navigated market shifts and economic fluctuations. Its ability to adapt, innovate, and stay customer-centric has ensured sustained strength and leadership in the Indian automotive market.

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Toyota, a Japanese multinational automotive manufacturer, is renowned for its risk management and resilience in the automotive industry. The company's Toyota Production System, which emphasizes lean manufacturing and just-in-time principles, enables it to respond quickly to changes in demand and manage supply chain disruptions effectively. Toyota's focus on quality, continuous improvement, and risk mitigation contributes to its competitive advantage and reputation for reliability in the global automotive market.

#### **Creating Entry Barriers :**

**"Entry barriers aren't walls to hide behind—they're strategic moats that force competitors to fight uphill battles."**

Creating entry barriers is a powerful competitive advantage. Companies achieve this by building strong brand recognition, proprietary technologies, extensive distribution networks, customer loyalty, and navigating regulatory complexities. These factors make market entry costly or difficult for new players, allowing established firms to protect market share, strengthen leadership, and sustain long-term profitability.

"Smart barriers don't just keep competitors out—they make customers reluctant to leave."

**Examples:** Patanjali has effectively created entry barriers in the Indian consumer goods market. By leveraging the trust and popularity of Baba Ramdev, promoting natural and Ayurvedic products aligned with consumer health trends, and combining this with aggressive pricing and a vast distribution network, Patanjali established a stronghold that makes it difficult for new entrants to compete effectively.

Tesla, an American electric vehicle manufacturer, has established entry barriers through technological leadership and brand positioning. Boeing and Airbus, both global aerospace manufacturers, have effectively created entry barriers in the commercial aircraft industry. Coca-Cola, a multinational beverage company, has created entry barriers through its extensive distribution network and brand recognition.

#### **Talent, Expertise & Knowledge Pool - Continuous Learning:**

**"Your people aren't just employees—they're your competitive intelligence, innovation engine, and execution advantage all rolled into one."**

Attracting skilled talent and nurturing a culture of continuous learning are vital sources of competitive advantage. Organizations recognized for their strong market position and growth potential are seen as employers of choice, drawing top industry talent. By fostering innovation, collaboration, and ongoing skill development, they not only retain high performers but also build a future-ready workforce that drives sustained success.

"The best talent doesn't just work for you—they think, innovate, and evolve with you."

**Examples:** McKinsey & Company, a global management consulting firm, is known for its highly skilled consultants and subject matter experts across various industries. McKinsey's reputation as a trusted advisor gives it a competitive advantage in providing strategic insights and delivering value to clients.

Similarly, Google, renowned for attracting top talent, investing in employee development, and staying at the forefront of technological advancements, an Indian multinational technology companies, Infosys & Tata Consultancy Services (TCS), have built a strong talent pool of skilled professionals in the field of information technology.

#### **Compliance, Regulatory & Legal Advantage**

**"Regulatory compliance isn't just following rules—it's mastering the game board while competitors are still learning to play."**

Compliance, regulatory, and legal excellence can be a strong competitive advantage. By strictly adhering to laws, regulations, and industry standards, companies gain credibility, risk protection, and stakeholder trust, while also avoiding penalties and disruptions. Proactive compliance often creates an edge by enabling smoother operations, faster market approvals, and stronger reputational standing over less-prepared competitors.

"Smart compliance creates sustainable moats that money alone can't breach."

**Examples:** Tata Power has demonstrated how proactive compliance creates advantage by aligning with environmental regulations, driving renewable energy initiatives, and positioning itself as a responsible and preferred energy provider.

Similarly, Johnson & Johnson's strong focus on compliance and regulatory affairs has enhanced its brand reputation, customer loyalty, and global competitiveness, proving that adherence to standards can be a strategic differentiator.

Boeing, an American aerospace manufacturer, operates in a highly regulated industry with strict compliance requirements. The company's robust compliance programs ensure adherence to safety standards, regulatory guidelines, and airworthiness certifications. Similarly, PayPal, a global digital payments company, has established a regulatory and legal advantage through its compliance with financial regulations and anti-money laundering laws.

#### **Conclusion:**

In conclusion, competitive advantage is the cornerstone of business success. We explored major sources—ranging from cost leadership, differentiation, innovation, intellectual property, brand equity, customer relationships, resilience, compliance, and more—along with real-world examples that show how firms leverage them across industries. Importantly, companies often combine multiple sources to craft a unique and sustainable position.

Since competitive advantages are dynamic, not static, organizations must evolve with market shifts, industry trends, and their own strengths to stay ahead. When nurtured strategically, competitive advantage empowers businesses to attract customers, command loyalty, grow revenues, expand market share, and ensure long-term leadership.

The Article can also viewed @ [https://youtu.be/eNcs7zNlt\\_A](https://youtu.be/eNcs7zNlt_A)

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## BRANCH NEWS

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### THIRUVANANTHAPURAM BRANCH

Indian Institute of Materials Management Thiruvananthapuram Branch conducted its Annual General Meeting 2024-25 on 16<sup>th</sup> August 2025 (Saturday) at IIMM hall, Sasthamangalam

Chairman Dr. Koshy M George declared the meeting open and welcomed the members gathered for the meeting. In his presidential address Chairman briefed the details of the activities conducted during the report period. The Annual Report presented by the Secretary and the Annual Accounts presented by the Treasurer were passed by the General Body.

The Branch elected the Executive Committee for the period 2025-27. The following are the new Executive Committee members.

- |                           |   |                                      |
|---------------------------|---|--------------------------------------|
| 1.Dr.Koshy M George       | : | Chairman                             |
| 2.Mr.K Raveendraprasad    | : | Vice Chairman                        |
| 3.Mr.M G Narayanan Nair   | : | Hon. Secretary                       |
| 4.Mr.P C Sasikumar        | : | Hon. Treasurer                       |
| 5.Mr.K G Nair             | : | NC Member                            |
| 6.Mr.M Janardhanan        | : | NC Member                            |
| 7.Mr.R Sivanandan         | : | EC Member                            |
| 8.Mr.Jose P L             | : | EC Member                            |
| 9.Mr.Harikrishnan R       | : | EC Member                            |
| 10.Mr.S Jayachandran Nair | : | Nominated Executive Committee Member |
| 11.Mr.Santhoshkumar V K   | : | Nominated Executive Committee Member |
| 12.Mr.S Thanumoorthy      | : | Nominated Executive Committee Member |
| 13. Mr.M P Ramachandran   | : | Education Co-ordinator               |



*A view of the audience*

After completion of the business of AGM, Mr.R Sivanandan gave a brief presentation on the five pillars of health or the five principles of health. They are Proper Breathing, Right quantity of Food, Right Exercise, Enough Rest and Positive Thinking. By incorporating these five

principles into daily life, individuals can strive for optimal health and well-being, preventing disease and enhancing overall quality of life.

Vice-Chairman Sri K R Prasad proposed vote of thanks.

The program ended with lunch.

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### HYDERABAD BRANCH

#### Hyderabad Elects First Woman Chairperson :

The Indian Institute of Materials Management (IIMM), Hyderabad Branch, marked a significant milestone during its 50th Annual General Body Meeting held on 10th August 2025 at the FTCCI Building, Red Hills, Hyderabad. In a proud moment inspired by the Government of India's "Nari Shakti" initiative, the branch elected its first-ever woman Chairperson, setting a new precedent in its leadership history.



Chair Person: Mrs S Suvarna

EC Team

Executive Committee (for 2025-27):

\*\*Chairperson: Mrs. S. Suvarna

\*Vice Chairman: Mr. K.V.N.P. Janardhan

\*Secretary: Mr. A. Varaprasad

\*Treasurer: Mr. D. Sarath Chandra

\*\* National Council Members:

\* Mr. D. Dasaradha Reddy

\* Mr. A. Preetam Kumar

\* Mr. Chandra Sekar Deshpande

\*\* Executive Members:

\* Mrs. M Lavanya

\* Mr. P. Surendra Kumar

\* Mr. L.V. Prasad

\* Dr. G.B.R.K. Prasad

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### AYODHYA BRANCH

1st Anniversary celebration and 203rd NC meet at Ayodhya. The host branch welcomed all the Guests and their families to the city of Lord Ram. Team also arranged darshanam of Lord Ram in two sessions.

This newly borne baby of IIMM family celebrated its first anniversary in on 26th July, 2025 in the august of presence of not only seven distinguished FNPs namely Sri CL Kapoor, LP Patel, SK Sharma, OP Longia, Bala Iyer, Dr Suresh Kumar and Malay Mazumdar but also NEC consisting of respected VPW Pankaj Panchabhai, NST RK Rastogi, Sr VP PM Bidappa and our dynamic leadership known as Lalit Raj Meena Sa. Apart from these dignitaries Chairmen and NC Members from twenty plus branches also graced the occasion. The program started with welcome by team Ayodhya dressed in unique common attire. The National President Sri Lalit Raj Meena Sa was the key note speaker on the title of National Seminar Quality Procurement in Public Healthcare Systems.

Apart from other speakers program was also graced with presence of Chief Guest Prof (Dr) PK Singh, former Director of AIIMS Patna and former Vice Chancellor of UP University of Medical Sciences. Few CEOs were felicitated by NP for their outstanding contribution in the field of SCM. Within a short span of just one year, branch is credited with many milestones like holding NC at its establishment time, record number of paid life members at the opening time and holding another NC within one year. This all was possible due to untiring efforts of team Ayodhya where we believe Unity is strength and this was well rewarded too, when our National President decorated with President Medal and certificate to officials namely Dinesh Srivastava, Sanjay Jain, Reema Srivastava, R. K. Sharma, Pradeep Verma and Adm'sh Gautam.

The award also make the awardees feel to work harder for the betterment of the branch. The entire program went very well followed by cultural evening and delicious dinner in attendance with better half of many IIRunians, delegates and guests. Next day ie 2ih July 203 rd National Councillors meet was organized in which approx forty members attended the meet. IIMM Ayodhya branch extends heartfelt thanks to all the dignitaries who made it to the city of Lord Ram Lala.

Jay Siya Ram.



The Election Officer Sri NR Kasliwal after arriving at a consensus and agreed upon unanimously during the AGM meeting declared following elected as:

1. Branch Chairman : Sri Abhay Mehrotra
2. Vice Chairman : Sri Sanjay Dua
3. Hon. Secre~ary : Sri Deep Chand
4. Treasurer : Sri Ashish L. Khairkar

5. National Councillors: Dr Harendra Kumar and Sri V. V. Chaturvedi
6. Executive Members (elec~ed): Sri Dinesh C Srivastava, Sri Pradeep Verma and Sri Arun Kumar (Co-opted) Sri P. C. Khanna and Sri C. M. Mishra



Vote of thanks by Hon Secretary: Sri Deep Chand Hon Secretary expressed his heartfelt thanks to all the esteemed members, out going office bearers for their immense contribution, newly elected office bearers and the Branch Chainnan Sri Abhay Melu'otra Ji.

## IIMM NHQ MUMBAI

IIMM NHQ has organised a one day training program on Industry 4.0 at Indian Security Press at Nashik on 7.8.25. App 30 participants attended the program. Mr Rajesh Bansal Chief General Manager inaugurated the training.



Myself and Mr L.R. Meena were faculty. Two training program on Competitive, Compliance and sustainable Warehouse and inventory control was also organised at NHQ Belapur Navi Mumbai on 8th and 9th August 2025. Myself and Jayanta Chakraborty are faculty and delegates from Reliance, Godrej and BPCL etc are participating.



**BOS MEETING HELD ON 30<sup>TH</sup> AUGUST 2025 :** IIMM Board of Studies (BOS) Meeting was conducted on 30<sup>th</sup> August 2025 at The Royal Habitat Center, Greater Noida. The meeting was well received and attended by eminent academicians and industry experts from all over the country.

Dr. Suresh Kumar Sharma, Co-Chairman BOS, welcomed the BOS members with the floral welcome of BOS members and invited Sh. K P Singh, Chairman, Greater Noida Branch for his welcome address to BOS members on behalf Greater Noida Branch.

Prof. Dr. Sibaram Khara, Hon'ble Vice Chancellor, Sharda University was invited as chief guest. Co-Chairman BOS requested Hon'ble VC to inaugurate the BOS meeting by lighting the lamp alongside Former National Presidents of IIMM, Academicians and Executive Director of SAIL Mr. S J Ahmed.

Thereafter, Mr. L R Meena, National President, welcomed the BOS members and spoke on necessity of upgrading and innovating the new educational programs. Mr. Meena apprised the house about new initiatives taken by IIMM in the education sector in collaboration with other universities and upcoming proposals. With this the floor was opened for deliberations.

BOS members provided their valuable inputs on the agenda points like revision of study material of PGDMM and PGDL&SCM Program, Online Short term programs, new innovative programs in the biomedical sector and so on. In total the meeting saw a healthy and fruitful discussion in taking IIMM education to a new height.

The meeting was concluded with vote of thanks from Mr. G K Agnihotri, VP North, IIMM.

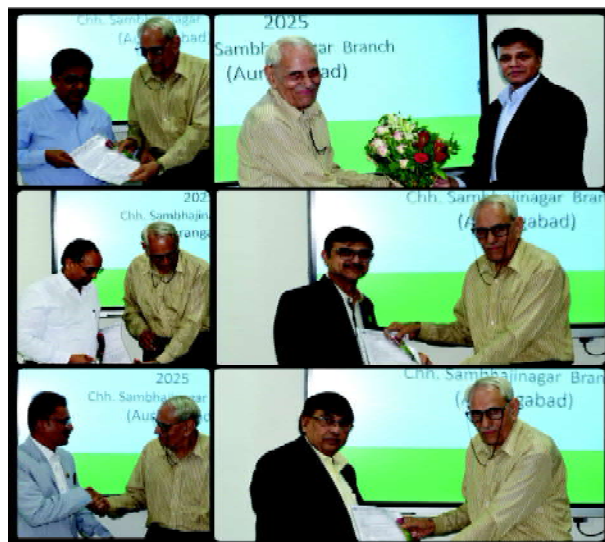
## CHATRAPATI SAMBHAJINAGAR

IIMM Aurangabad branch has been held on 2nd August 2025 at IIMM Branch Office, Chatrapati Sambhajinagar. IIMM members from different industries were present for the AGM. Mr.Paras Mutha Honorary Secretary of the branch presented Branch Progress Report of 2023-25 in the AGM.

Mr. Lalat Lohade Treasurer of the branch presented Audit Report - Profit & Loss Account for the year 2024-25 and Balance Sheet as on 31st March 2025 as per Audit Report have been signed by National Auditor CHandabhoy & Jassobhoy. **Mr.K.Srihari proposed** for Audit Report for

approval and **Mr.Sushil Pande seconded** for the Audit Report approval.

Dr.P.S.Minhas was appointed as an Election Officer for Election process. As per the letter received from NHQ dated 3rd July 2025, Chairman of the branch have send AGM Notice to all member with AGM scheduled. Newly elected Chairman Mr.Sushant Patare said that various skill development programmes will be implemented in the next two years 2025-27. Coordinator Ramesh Jaulkar worked for the success of the AGM.



Mr. Phanikumar thanked to the Branch Chairman, all Executive Council Members and Members for present and attend the AGM. Hope you will continue your usual support to us.

## KANPUR BRANCH

IIMM Kanpur branch has organized Annual General Meeting on 17th August 2025 Sunday in Suthi Mani Restaurant. Prior 21 days advance notice was sent to all the members for the AGM for year 2024-25 along with election of new executive committee of Kanpur Branch for the year 2025-27



Mr. Ashwani Kumar: Election Officer Declaring The Election Results.

The Welcome address Given by Mr. Saurabh Chaturvedi Hony Treasurer and entire program was compared by him. The present committee was requested to share the dais.

Mr. Kailash Nath present Chairman of Kanpur branch has apprised all the present members about all the branch activities during year 2024-25 and requested to start the AGM for the year 2024-25. The Balance Sheet for the year 2024-25 was presented by Hony Treasurer Mr. Saurabh Chaturvedi which was first by Mrs. Chitra Singh and seconded by Mr. Abhishek Kandpal. The balance sheet was passed by all the present members by clapping.

As per agenda point, the election result was declared by Election officer Mr. Ashwani Kumar Life member of this branch. The details of new branch executive committee are as follows.

- 1- Mr. Sanjay Awasthi- Chairman
- 2- Dr. Pankaj Kumar Mehrotra - Vice Chairman
- 3- Mr. Kailash Nath - Hony secretary
- 4- Mr. Saurabh Chaturvedi - Hony Treasurer
- 5- Mr. Gopi Krishna Agnihotri - National Councilor
- 6- Mr. Rajendra Kumar Dixit- National Councilor
- 7- Mr. Abhishek Roy- Executive Member
- 8- Mrs. Chitra Singh- Executive Member
- 9- Mr. Ravi Ranjan- Executive Member



Mr. Saurabh Chaturvedi Hony Treasurer Presenting Balance Sheet For Year 2024-25.

The elected office bearer has resumed the charge of their post. The New chairman Mr. Sanjay Awasthi has presented the road map of Kanpur branch and assured all the present members that he will make all out efforts to uplift the branch during the next two years. Mr. Gopi Krishna Agnihotri VP North and National Councilor of Kanpur Branch has also graced this occasion

The vote of thanks given by Dr Pankaj Kumar Mehrotra and AGM was concluded followed by lunch.

## PUNE BRANCH

**Pune Branch AGM :** Pune branch under the Chairmanship of Mr. Suhas Gawas held its 59<sup>th</sup> AGM at the branch office on Saturday, 23<sup>rd</sup> August 2025, which was attended by 35 members.

The Hon. Secretary, Mr. Arjunsingh Rajput, officially commenced the Annual General Meeting by inviting all participants to observe a two-minute silence in memory of Mr. Prashant Y. Bendre, former Chairman of the IIMM-Pune Branch (1991-1993), Vice President, West (1993-1995) and a distinguished members who departed for his eternal abode on 2<sup>nd</sup> August 2025. Mr. Rajput then welcomed Chairman Mr. Suhas Gawas to deliver his opening address.



Chairman Mr. Suhas Gawas extended a heartfelt welcome to all members and expressed his gratitude for their attendance, particularly given the adverse weather conditions. He shared updates regarding the innovative initiatives being launched by the branch, such as the Kaizen Competition and the Case Study Writing Competition during his tenure as the chairman. Mr. Suhas Gawas emphasized the critical role of member engagement in all upcoming branch activities in his address to the members.

Following this, Hon. Secretary Mr. Arjunsingh Rajput presented a comprehensive report outlining the branch activities over the past year. The report highlighted various Executive Development Programs, Industrial visits, Onsite training sessions, Educational initiatives, and Knowledge-sharing events organized for the benefit of members. He further informed members present that during the 2024-25 period, the branch successfully conducted twelve Executive Committee Meetings and five Education Committee Meetings.

In the absence of the Hon. Treasurer, Vice Chairman Mr. Prasad Rao presented the financial accounts for the year 2024-25. The election for the Executive Committee members for the term 2025-2027 was conducted by the appointed Election Officer, Mr. Prashant Mulay, a life member of IIMM-Pune.

IIMM-Pune: Executive Committee Members - 2025-27

| Sr.no | Names of Members          | Membership No. | Elected as                                 |
|-------|---------------------------|----------------|--------------------------------------------|
| 1     | Mr. Suhas Gawas           | L/0436/PN      | Elected Unopposed as Chairman              |
| 2     | Mr. Prasad Rao Nagoor     | L/5213/PN      | Elected Unopposed as Vice Chairman         |
| 3     | Dr. Kaustubh Khadke       | L/3919/PN      | Elected Unopposed as Hon. Secretary        |
| 4     | Dr. Shaji Joseph          | L/7038/PN      | Elected Unopposed as Hon. Treasurer        |
| 5     | Mr. Mohan Nair            | L/0295/PN      | Elected Unopposed as National Councilor    |
| 6     | Mr. K R. Nair             | L/0089/PN      | Elected Unopposed as National Councilor    |
| 7     | Mr. Terrence Fernandes    | L/3721/PN      | Elected Unopposed as National Councilor    |
| 8     | Mr. Amit Borkar           | L/3666/PN      | Elected Unopposed as National Councilor    |
| 9     | Mr. Sanjay Suranglikar    | L/6129/PN      | Elected Unopposed as Exe. Committee Member |
| 10    | Mr. Sanjay Shitole        | L/0458/PN      | Elected Unopposed as Exe. Committee Member |
| 11    | Ms. Anuradha Thakur       | L/4194/KP      | Elected Unopposed as Exe. Committee Member |
| 12    | Mr. Murl Ramchandran      | L/3506/PN      | Elected Unopposed as Exe. Committee Member |
| 13    | Mr. Venkatesh G. Kulkarni | L/3124/PN      | Elected Unopposed as Exe. Committee Member |
| 14    | Mr. Sandeep Shandilya     | L/7276/PN      | Co-opted Member                            |
| 15    | Mr. Shripad Kadam         | L/6661/PN      | Training & Course Co-ordinator             |

As the branch had received 13 nominations for 13 available positions of Chairman, Vice Chairman, Hon. Secretary, 4 National Council Members, 5 Executive Committee, no election was held, and the election officer, declared the names of the new Executive Committee as elected unopposed.

In his inaugural address, the new Chairman, Mr. Suhas Gawas, expressed his gratitude to the members for their trust and confidence in his leadership. He emphasized his commitment to fostering growth and enhancing the overall functioning of the branch.

The meeting concluded with a vote of thanks delivered by the new Hon. Secretary, Mr. Kaustubh Khadke.

### **Report on One-Day Training Program on “Mitigating Procurement Risk” Organized by IIMM – Pune**

The Indian Institute of Materials Management (IIMM), Pune Branch successfully conducted a one-day onsite training program on the topic “Mitigating Procurement Risk” for the Procurement Team of Kirloskar Brothers Ltd. on 24<sup>th</sup> July 2025.



The session was delivered by one of IIMM Pune's expert faculty members & Hon. Secretary, Mr. Arjunsingh Rajput, who brought in-depth knowledge and practical insights to the training. The program comprehensively covered various aspects of risks involved in procurement, including risk identification, assessment, mitigation strategies, supplier-related risks, and contract management practices.

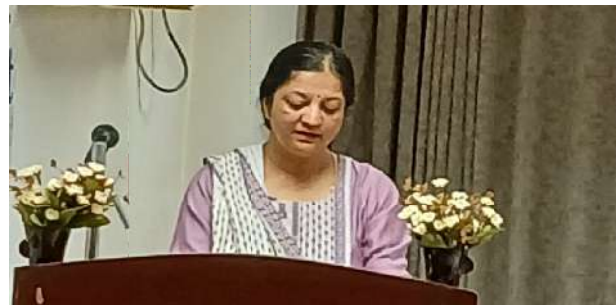
The session was highly interactive and tailored to the specific needs of the organization. It was well-received by the participants, with around 20 team members from the procurement function attending the session. The participants appreciated the relevance of the content, the practical approach adopted by the faculty, and the

opportunity to engage in meaningful discussions around real-world procurement challenges. The program concluded with positive feedback from the attendees, reinforcing the value of such focused training initiatives in strengthening procurement capabilities and risk preparedness.

## **VADODARA BRANCH**

IIMM Vadodara Branch successfully organized an engaging Evening Talk on the theme “MIND POWER” by Mr. Srinivas Darbha on 2<sup>nd</sup> August, 2025 at IIMM Conference Room.

The session was very interactive and the speaker explained about understanding the intricacies of the mind and brain, conditioning, energy dynamics, and harnessing the power of the subconscious mind and brain waves for optimal living. Transforming People and Performance, solving problems, adding value to individuals' lives, and maximizing their true potential by fostering an understanding of self and others, with a keen emphasis on holistic development across HRCM (Health, Relationship, Career/Business, and Wealth). The event received high appreciation for the speakers, the subject matter. Around 30 members have attended the Evening Talk.



62<sup>nd</sup> Annual General Meeting of IIMM Vadodara Branch was held on 24<sup>th</sup> August, 2025 @ 6.00 PM at Syndicate Hall of Hotel Grand Mercure Surya Palace. As per the agenda, audited Income & Expenditure Account and Balance Sheet for the year ended 31.3.2025 and appointment of Auditors for year 2025-26 was passed unanimously.

The nominated Election Officer declared the names of newly elected Executive Committee for year 2025-27. Chairperson, Dr. Bharti Trivedi thanked the Election Officer and announced the conclusion of AGM. After that the working report for year 2024-25 was presented by Dr. Bharti Trivedi.

The newly elected Executive Committee headed by Chairperson Dr. Bharti Trivedi after taking charge for the third consecutive term, advanced the proceedings at 7.00 PM, welcomed the distinguished dignitaries and IIMM members and their spouses. On this occasion, Shri Lalbhai Patel & Shri Malay Mazumdar shared their views. The Chief Guest - Shri Sanjeev Varma, Executive Director-GSFC and the Guest of Honour - Dr. Jayesh Thakkar, CMD-Mercury EV-Tech Ltd. also addressed the gathering.

Mr. Rakesh Desai, Vice Chairman delivered the vote of thanks and the function was followed by dinner.

#### New EC Members of Vadodara Branch:

#### NEW TEAM MEMBERS FOR THE YEAR 2025 - 2027

| Sr. No | Post               | Name                          |
|--------|--------------------|-------------------------------|
| 1      | Chairperson        | Dr. Bharti A Trivedi          |
| 2      | Vice Chairman      | Mr. Rakesh D Desai            |
| 3      | Honorary Secretary | Mr. Krunal Shah               |
| 4      | Honorary Treasurer | Mr. Kishorkumar M Patel       |
| 5      | NC Member          | Mr. Lalbhai P Patel           |
| 6      | NC Member          | Mr. Malay Chandan Mazumdar    |
| 7      | NC Member          | Mr. Anand B Purohit           |
| 8      | NC Member          | Mr. Bharat S Sodha            |
| 9      | NC Member          | Dr. Prashanta Gupta           |
| 10     | EC Member          | Mr. Manojkumar R Patel        |
| 11     | EC Member          | Mr. Surendra V Dhumal         |
| 12     | EC Member          | Mr. Vasudev B Harani          |
| 13     | EC Member          | Mr. Darshansinh P Parmar      |
| 14     | EC Member          | Mr. Yashvantsinh Rathod       |
| 15     | EC Member          | Mr. Hariram Kartikeyan Rajesh |



## KOLKATA BRANCH

### CELEBRATION OF 79<sup>TH</sup> INDEPENDENCE DAY on 15<sup>th</sup> August, 2025

IIMM Kolkata proudly observed the 79th Independence Day on Friday, 15th August 2025 with patriotic fervour and solemnity. The National Flag was hoisted by Mr. K. Gupta, Administrative Manager in front of IIMM Premises at 8B, Short Street. IIMM office staffs and few students and members attended the programme.



Mr. K. Gupta Administrative Manager, in his brief address before the gathering, remembered the sacrifice of lakhs of freedom fighters to the cause of our beloved motherland. Other attendees also spoke on the occasion and viewed that India was partitioned following communal riots in many parts of the then undivided India and it was divided in two parts on religious confrontation before we got freedom. According to them India would not have been partition if Netaji Subhas Chandra Bose was there at that time.

We remembered the freedom fighters singing National Anthem "Jana Gana Mana". The programme was concluded with distribution of sweet packets to the attendees.

**Report on 64th Annual General Meeting of IIMM, Kolkata Branch :** IIMM, Kolkata Branch successfully conducted its annual General Meeting (AGM) on 22nd August, 2025 at the Saturday Club Ltd., Kolkata



Mr. Koushik Roy, outgoing Chairman, warmly welcomed the gathering. Altogether one hundred ten (110) members attended the 64th Annual General Meeting. Few members attended with their spouses. The newly elected Chairman, Mr. Animesh Chattopadhyay, addressed the members and shared his vision for the growth of IIMM in the coming year. Newly elected Executive Committee

under the leadership of the elected Chairman for the year 2025-27.

The following office bearers have been elected uncontested:-

- |                    |                                                                                  |
|--------------------|----------------------------------------------------------------------------------|
| 1. Chairman        | Mr. Animesh Chattopadhyay<br>Chief General Manager,<br>Haldia Petrochemical Ltd. |
| 2. Vice Chairman   | Mr. Anup Kumar Dey<br>Ex. Senior Vice President<br>Electro Steel Casting         |
| 3. Hony. Secretary | Mr. Prasun Ganguly<br>Consultant Veedol<br>Corporation Limited                   |
| 4. Hony. Treasurer | Mr. Joydip Basak<br>Dy. General Manager<br>Gainwell Group                        |



#### A. EXECUTIVE COMMITTEE MEMBERS FOR THE YEAR 2025-27

- Mr. Ravi Kant Maheshwari  
Vice President (SCM), NF Forging
- Mr. Partha Sarathi Bose  
Dy. General Manager,  
Garden Reach Ship Builders & Engineering  
Limited (GRSE)
- Mr. Proloy Chakraborty  
Manager-Materials  
Larsen & Toubro Ltd.
- Mr. Ushnish Basu  
Sr. Manager- Purchase  
CESC Limited
- Mr. Joyanta Biswas  
Management Consultant

#### NATIONAL COUNCIL MEMBERS FOR THE YEAR 2025-27

- Mr. Debasis Mallick  
Free Lance Educationist
- Mr. Sajal Das  
Associate Director  
Linde India Ltd.
- Mr. Amal Chakraborty  
Consultant, Power & Protection
- Mr. Rajib Chandra Kumar  
Knowgen Education Services Pvt. Ltd.

## LUCKNOW BRANCH

Annual General body Meeting of IIMM, Lucknow Branch held on 24-8-2025 (Sunday) at 11:30 in Hotel Royal cafe, opp. Saharaganj, Hazratganj Lucknow. Sri P.K Bajpai N.C Welcomed all members and informed about the agenda points. First of all he read the minutes of meeting last year A.G.M The minutes approved unanimously.

Past chairman Mr. Krishan gopal gave his power point presentation for 2 years plan of year 2023- 2025. Mr. Atul kumar, Sr manager Tata motor, treasurer, lucknow branch presented the balance sheet through power point & requested the August body to adopt the account.

Sri Rajan Srivastava Proposed & Mr. C.K Vishwakarma ED HAL, LKO very senior life member of Lucknow branch seconded of adoption of the accounts, Sri. S.KJha, Ex managing director HAL accessories complex Lucknow and advisor of IIMM Lucknow branch Mr. Bhola shanker A.G.M (planning) HAL corporate office & many members given their prospective idea for growth of IIMM,LKO, Branch. 90 members are attended A.G.M.

After adoption the Accounts 2023-25. Election process started. Since No nomination Recd Hence following team elected for year 2025 to 2027.

#### Newly elected committee for year 2025-27

##### NAME - DESIGNATION

- Mrs. Ruchi Agarwal Addl, G.M ,HAL,LKO - Chairman
- Mr. KRISHAN GOPAL (DY G.M (IMM) HAL, LKO -Chairman (Past)
- Mr. BRAJESH SINGH (General Manager Tata Motors LKO) - Vice Chairman
- Dr. VIKRAM BISEN (Chairman Basudev Charitable trust) - Secretary
- Mr. C.B.SRATHORE - Treasurer
- Mr. ATUL KUMAR (Chief Manager Tata Motors LKO)- No.1
- Mr. D.K.DUBEY CH. Manger, HAL,LKO - No.2
- Mr. RAJAN SRIVASTAVA (Sr MGR(H.R) HAL,LKO - No.3
- Mr. MOHD AMIL - Elected Member
- Mr. ABHISHEK KUMAR - Elected Member
- Mr. SIDHESH DUBEY - Elected Member
- Mr. ASHISH SRIVASTAVA, CHIEF MANAGER ,HAL,LKO - Elected Member
- Mr. MRITUNJAY KUMAR ( Ch.MGR (OS)HAL,LKO - Co-opted Member
- Mr. RAVI KANNAUJIYA ,SR MANAGER (IMM) HAL ,LKO - Co-opted Member
- Mr. S.K JHA (EX MDA)HAL Complex ,LKO - Advisor
- Mr. BHOLA SHANKER (EX AGM Planning) HAL (CO) BANGLORE - Advisor
- Mr. S.P VARSHNEYA - Advisor

New Chairman Mrs. Ruchi Agarwal Addl, G.M of HAL Accessories Division has given Power point presentation for New prospective Plans regarding AI & services specially Make in India vision .

Mr. Brajesh singh general manager TATA Motors, & Vice Chairman of IIMM, Lucknow branch given their power point presentation for increase the income of the branch.

Committee appreciated & take this for discussion in monthly meeting. Vote of thanks given by CBS Rathore, Treasurer LKO Branch and above A.G.M Followed by Lunch.

## MUMBAI BRANCH

**IIMM Mumbai CPO Roundtable, August 22, 2025, Theme: Rethinking Procurement KPIs for a New Risk Environment**  
IIMM Mumbai successfully hosted a high-impact CPO Roundtable, bringing together senior procurement leaders from over 25 leading organizations including Reliance, Ultratech Cement, L&T, Mahindra, Century Enka, HDFC, Shapoorji Pallonji, Galaxy Surfactants, PI Industries, Toyo Engineering, Worley Parsons, Lupin Pharma, and many more.

The event centered around a thought-provoking research paper presentation on the evolving landscape of procurement KPIs in today's dynamic risk environment. It sparked meaningful dialogue, shared perspectives, and insightful discussions around best practices, emerging trends, and innovative strategies. Beyond the exchange of ideas, the roundtable provided an excellent platform for networking and strengthening professional connections within the procurement and supply chain community.



Sharing a glimpse of the event — [Attached Collage of Event Highlights] We thank all the participants for their valuable insights and engaging presence. Looking forward to more such enriching conversations ahead!

## UDAIPUR BRANCH

At the beginning of the meeting, after confirmation of quorum, the outgoing Branch Chairman Mr. Anil Mishra delivered the welcome address. He expressed gratitude to all Executive Members for their cooperation during his tenure and emphasized the importance of developing future leadership.



Annual Meeting of the Indian Institute of Materials Management (IIMM) & Elections for 2025 – 2027 were organized at Hotel Uda Median on 17<sup>th</sup> Aug 2025.

Secretary Mr. P.P. Bhattacharya presented the minutes of the previous Annual General Meeting, which were passed unanimously. Presenting the Annual Report of the branch, the Honorary Secretary highlighted the achievements of the past year and stated that the year had been an excellent example of smooth management and sustainable growth. He mentioned the appreciation received from the National Executive Committee and the new initiatives carried out during the year. He also provided details about 5 new short- term courses launched under the Institute's Education Division, which are completely online and available at very nominal fees.

Joint Treasurer CA Pallavi Nahar presented the Annual Accounts, which were unanimously approved by the house. Subsequently, the Election Officer Mr. R.C. Mehta announced the list of nominations received for various positions and declared the following team unanimously elected. On this occasion, Ms. Priya Mogra of Shilpa Trade Links Pvt. Ltd. was elected as the Chairperson of IIMM – Udaipur Branch.

Mr. Rajesh Jain was elected as Vice Chairman, Mr. P.P. Bhattacharya as Honorary Secretary, Ms. Haseena Chhakiwala as Joint Secretary, Mr. Anil Parikh as Honorary Treasurer and CA Pallavi Nahar as Joint Treasurer of IIMM – Udaipur Branch.

Dr. Ashok Jetawat and Mr. Nikhil Sharda were elected as National Counselors.

Mr. Rajendra Daga, Mr. Mubarak Khan and Dr. Manisha Agrawal were elected as Executive Members.

On this occasion, in the presence of representatives from various industries and members, extensive discussions were held on several new strategies. Resolutions were passed to collectively work for the development of the branch as well as the institute as a whole. The action plan for 2025–26 was presented, and deliberations were held on the financial status of the branch.

The newly elected Chairperson Mrs. Priya Mogra expressed her gratitude to all newly elected members and resolved to take the IIMM – Udaipur Branch to greater heights.

At the conclusion of the meeting, Joint Secretary Mrs. Haseena Chhakiwala delivered the vote of thanks.



INDIAN INSTITUTE OF  
MATERIALS MANAGEMENT  
BANGALORE BRANCH



scale  
2025

## Silver Jubilee Edition

“Resilient, Responsible, Collaborative AI & ML Driven  
Supply Chain for future vision”

**Venue: The Capitol Hotel, Raj Bhavan Rd,  
Bengaluru**  
**6th September 2025 at 9.00 AM to 6.00 PM**

Click the Link for Register

<https://forms.gle/aZ2g3QQMLo4DgcPO8>

Scan the QR Code for  
Registration



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IIMM Research Centre

## CENTRE FOR RESEARCH IN MATERIALS MANAGEMENT (CRIMM)

IIMM has set up CRIMM in Kolkata jointly with the Techno India University which is one of the renowned and largest Private University in West Bengal. A MOU was signed with TIU on 17th of November, 2017. Techno India University, West Bengal, promoted by the well-known Techno India Group is a leading Private University in the state and the country

### Objectives and Activities of CRIMM in brief

- To promote research in materials management discipline.
- To collaborate with industry for furthering the academic advancement of materials management and its application to industry.
- To render assistance to industries in problem solving projects, development activities, etc
- To take up project consultancy work in Materials Management. Centre will act as a nodal point for co-ordination and integration of research information in the field of Materials Management for on-going and completed research work in other countries

### Research Fellowship

The candidate should have a Master Degree in any subject/discipline or equivalent professional

Management qualification i.e. PGDBM, PGDMM etc. with at least 50% marks in aggregate at the graduation and post-graduation level. The candidate should have experience in working in Materials Management discipline or allied areas in industries. In case of highly experienced candidate in the field of Materials Management, and/or Engineering Graduates, Master Degree may be dispensed with. Preference will be given to industries sponsored candidates

The fees for such research studies will depend on the specific problem/area and the tenure, which will be borne by the sponsoring organisation. Those who will take up such Fellowship research studies on their own expenses, will have to bear the expenditure on their own. Successful Research Fellow from CRIMM shall have the unique opportunity to pursue PhD in Techno India University, West Bengal with condensed course work.

### Governing Committee

A steering Committee has been constituted to oversee the working of the centre consisting of nineteen members, eight from Techno India University, West Bengal, eight from IIMM, and three from industry.

For more information please contact

**Prof. (Dr.) Suresh Kumar Sharma**

Jt. Chairman –CRIMM

M: 09818464359

Email: [crimm.sureshiimm@gmail.com](mailto:crimm.sureshiimm@gmail.com)

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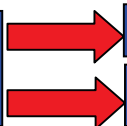
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