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MATERIALS MANAGEMENT REVIEW

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The Future of Business: Sustainable Supply Chain in India's CSR Landscape

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From the Desk of National President & Editor in Chief

Greetings from Your National President!!!

As we move towards 2025, the Indian supply chain is on the cusp of a transformative journey characterised by a dynamic interplay of technological advancements, sustainability considerations and evolving geopolitical factors. This presents both a challenge and a great opportunity for companies to consolidate their position as key players in the global market, which requires a strategic approach to foster innovation and build resilience across the supply chain ecosystem.

The widespread adoption of artificial intelligence (AI), machine learning and advanced analytics will be critical to optimizing inventory management, demand forecasting and real-time logistics tracking, enabling faster decision-making and improved operational efficiency.

Blockchain technology holds immense potential for improving supply chain transparency by providing a tamper-proof record of product movements, which is particularly crucial for sectors such as pharmaceuticals and food where traceability is paramount.

As environmental awareness grows, companies must prioritize sustainable practices throughout their supply chain, including eco-friendly packaging, carbon-neutral transportation and responsible sourcing.

The ongoing expansion of India's infrastructure network, including highways and smart logistics hubs, will be critical to improving connectivity and facilitating smoother movement of goods. As technology evolves, upskilling the workforce will be critical to effectively manage complex supply chains and utilize new technologies.

Fluctuations in global trade policies and potential disruptions due to geopolitical tensions will require proactive risk management strategies, and adapting to changing consumer demands, including personalized experiences and faster delivery expectations, will be key to maintaining competitiveness.

Foster strong partnerships with suppliers, logistics providers and technology partners to build a collaborative and resilient supply chain network. Leverage data analytics to identify trends, predict disruptions and optimize operations across the supply chain. Prioritizing investments in advanced technologies such as automation, robotics and IoT to streamline processes and increase efficiency. Integrating sustainability goals into supply chain strategies to minimize environmental impact and improve brand reputation.

Navigating the complex landscape of the Indian supply chain in 2025 requires a strategic approach that combines technological innovation with a commitment to sustainability and resilience. By embracing emerging trends and fostering collaboration across the ecosystem, Indian companies can position themselves as leaders in the global marketplace and contribute to the country's economic growth.

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CONTENTS

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SUSTAINABLE PROCUREMENT – A WAY FORWARD

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Abstract: The author has introduced different versions of definitions of ISO, UNEP, ISM and others. Sustainable procurement refers to how business can identify to reduce the environmental impacts of their supply chains. The three important pillars such as economic (profit), environmental (planet) and societal (people) and its key factors are highlighted. The key drivers for sustainable procurement like cost reduction, risk reduction and revenue growth are also discussed. Secondary sources and published papers have reviewed for discussion. The relevance of ISO 20400 and ISO 26000 standards of International Organization for Standardization (ISO) are discussed. The author has also introduced the Government E-Market (GeM) portal and its importance. The sustainable public procurement in India has highlighted with conventional approach and proposed approach with sustainable procurement cycle. Sustainable procurement implementation approaches like corporate social responsibility (CSR), product approach and process approach have also been emphasized.

Keywords: Green procurement, ISO 20400, ISO 26000, sustainable procurement philosophy, practices

1. Introduction : Procurement is the process of acquiring goods or services for the business. These goods or services are vital for the company's operations. These goods or services are acquired from the suppliers or third parties. The procurement process starts from the market exploration, identification & selection of sources, drafting the terms & conditions, placement of orders, receipt of goods or services from the suppliers and supply management. Sourcing and procurement plays as important role in supply chain management. 60-70 percent of product cost constitutes the material cost.

An organization's purchasing decisions don't only affect the organization itself; they affect the economy, environment and society. Procurement generally makes up a substantial part of an organi-zation's budget. In the public sector alone, it accounts for around 12 % of GDP and 29 % of government expenditure in the mem-ber countries of the Organization for Economic Co-operation and Development (OECD).

Sustainable procurement is a process whereby public sector meets its needs for goods, services, works and utilities in a way that achieves value for money on a whole life-cycle basis in terms of generating benefits not only to the organization, but also to society, whilst significantly reducing negative impacts on the environment (UNEP, 2015). Sustainable procurement refers to how buyers can identify to reduce the environmental impacts of their supply chains (Batra, 2023). Sustainable procurement involves environmental trends, using recycle paper, reusing packing material and healthy work environment.

Sustainable procurement is the act of adopting social, economic and environmental factors alongside the usual price and quality considerations by the organizations handling the procurement process and procedures (Niti Samani, 2023).

Sustainable procurement is the process of making purchas-ing decisions that meet an organization's needs for goods and services in a way that benefits not only the organization but society as a whole, while minimizing its impact on the environment. This is achieved by ensuring that the working conditions of its suppliers' employees are decent, the products or services purchased are sustainable, where possible, and that socio-economic issues, such as inequality and poverty are addressed.

Sustainable procurement is a strategic purchasing process that goes beyond economic factors. It considers environmental, social and governance (ESG) principles to ensure that organizations acquire products in a way that minimizes negative environmental impacts, promotes positive social outcomes and complies with regulations (Daryna, 2023).

1.1. Need for Sustainable Procurement

The following aspects are made business firms to adopt sustainable procurement practices:

i. Climate change
ii. Carbon emission
iii. Population change
iv. Increased risks
v. Compliances to the regulations

1.2. Objectives of sustainable procurement

The main objectives of sustainable procurement are:

i. Reducing greenhouse emissions
ii. Preserving bio-diversity and resources

iii. Absorbing child labor and forced labor
iv. Reducing inequalities
v. Supporting local and regional economic development and more.

1.3. Pillars of sustainable procurement : Three pillars of sustainable procurement are: Economic (Profit), Social (People) and Environment (Planet). Informally, these pillars of sustainable procurement are known as profit (= economic), planet (= environmental) and people (= social). Sustainable procurement hence incorporates sustainability considerations throughout the procurement process, to achieve optimum value for money in delivering the developmental objectives. Sustainable procurement is strategic procurement at its best.

Effective sustainable procurement supports sustainable development. Sustainable procurement is hence smart procurement as it takes a 3-dimensional life cycle approach against the one-dimensional, economics focused approach. Figure 1 shows three pillars of sustainable procurement

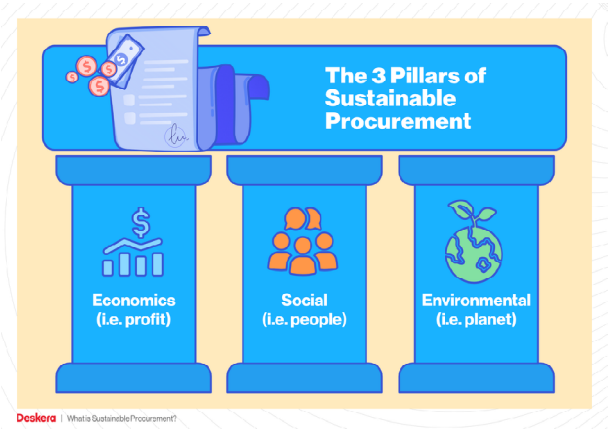

Figure 1: Three pillars of sustainable procurement (Source: Deskera Books)

Table 1 describes the details of three pillars of sustainable procurement.

Table 1: Three pillars of sustainable procurement

Economic Pillar of Sustainable Procurement	Environmental Pillar of Sustainable Procurement	Social Pillar of Sustainable Procurement
Economic regeneration	Environmental resource management	Human rights
Sustainable economic development	Urban planning	Clean drinking water
Emerging markets	CO2 reduction	Food security
Development of SMEs	Alternative energies like solar, windmill	Fair pay and labor law protections
Total cost of ownership and life cycle costing	Water management laws	Anti-child labor and forced labor
Value for money	Sustainable agriculture	Fair trade
Poverty reduction	Marine resources management	Health and safety
	Protection of Ecosystem	Gender Equality including universal education
	Pollution and waste management	Child mortality and maternal heath
		Healthy lives and well being for all

1.4. Drivers for sustainable procurement : Important drivers for sustainable procurement are: Cost reduction, Risk reduction and Revenue growth.

Cost reduction : Following sustainable procurement practices and decisions will lead to a reduction in the total cost of ownership. This is through reduced energy costs, reduced over-specification, reduced consumption & social and environmental compliance costs.

Risk reduction : By following sustainable procurement practices and decisions, risks are reduced because the company will no longer face the financial impact on brand value due to bad supplier practices like child labor and local pollution. The firm will also be saved from the economic costs of sustainable procurement disruptions like noncompliance with environmental regulations.

Revenue growth : By following sustainable procurement processes, the firm would be able to earn additional revenue through the innovation of Eco-friendly products & services and price premium or income from recycling programs.

Sustainable procurement practices are:
i. Adoption of Corporate Social Responsibility (CSR)
ii. Integration of goods specifications and criteria that are compatible with the protection of the environment and society
iii. Integration of business core values with supply chain practices

iv. Creating brand awareness and brand positioning
v. Adopting life cycle of goods and services

1.5. Benefits of sustainable procurement

The key benefits are:
i. Reduced risk and brand reputation
ii. Decreased cost
iii. Revenue growth
iv. Future proofing
v. Positive social and environmental impact
vi. Increased employee productivity
vii. Improved reputation among consumers
viii. Fostered innovation

1.6. Implementation of Sustainable Procurement Philosophy

Implementation of sustainable procurement practices brings lot of challenges to the business firms. The important challenges are grouped under each category:

i. Selection of Suppliers : Generally suppliers are selected based technical capability, financial soundness and clientele feedback. The order / contract award criteria are: price, quality, delivery, customer service, innovation etc. Under sustainable procurement, the suppliers are evaluated & shortlisted based on economic, social and environmental factors. If the suppliers are selected procurement based economic, social and environmental aspects, then, it is known as 'Green Procurement'.

ii. Scope of implementation : Scope also brings lot of challenges while implementing the sustainable procurement practices. The scope varies from main suppliers to tier-1 or tier-2 suppliers. The implementation becomes more complex, when we include more layers i.e tier-1 or tier-2 suppliers etc. So, deciding the appropriate level is important.

iii. ISO 20400 and ISO 26000 Standards : ISO 20400, Sustainable procurement – Guidelines, provides guidance for organizations wanting to integrate sustainability into their pro-curement processes. It is a sector-specific application of ISO 26000, Guidance on social responsibility, which it complements by focusing specifically on the purchasing function.

ISO 20400 : The standard defines the principles of sustainable procure-ment, including accountability, transparency, respect for human rights and ethical behavior, and highlights key con-siderations such as risk management and priority setting. It also covers various stages of the procurement process, outlin-ing the steps required to integrate social responsibility into the purchasing function.

ISO 20400 is a useful tool for boosting productivity, optimizing cost and stimu-lating innovation in the market. ISO 20400 provides guidelines, not require-ments. It is therefore not intended for certifica-tion purposes.

ISO 20400 Requirements:

The following have to be considered before getting started:
i. Examination of ' buying culture'
ii. Knowing the company's supply chain
iii. Thinking strategically
iv. Get buy-in from top management

ISO 26000 : Sustainable procurement is a key aspect of social responsibility. ISO 26000 formed the basis of ISO 20400, drawing on the same principles and core subjects of human rights, labor practices and fair business practices. As such, ISO 20400 will help individuals working in procurement to integrate the prin-ciples of social responsibility as described in ISO 26000 within the purchasing process.

1.7. GeM Portal : Government of E-Marketplace (GeM) is an initiative launched by the Government of India to facilitate all buyers and sellers (including MSMEs). The main objective of the GeM is to ensure effectiveness and transparency in public procurement. GeM has crossed the Gross Merchandise Value (GMV) of Rs.2 lakh crore in financial year (2022-23) which is 40 percent of total India's spend.

1.8. Public Procurement: Conventional Approach : A conventional procurement process is a linear process wherein the products or goods are evaluated based on the acquisition cost. Hence all air conditioners that meet the technical specifications would qualify for financial evaluation and the air conditioner which has the lowest initial cost would be selected. This process does not consider the total cost of ownership or environmental impact of the air conditioner through its life cycle. Conventional tendering approach consisting of the following steps:
i. Procuring agency defines specifications and requirements.
ii. Tender is floated and bids are received.
iii. Technical evaluation based on specifications.
iv. Financial evaluation (selection based on initial cost)

Proposed Sustainable public procurement approach

A green procurement process is a cyclic process wherein environmental aspects are included during all stages of the procurement. Evaluation in this type of procurement is done by giving value to environmental concerns. Ranking of the product will be based on a combination of environmental attributes, quality, and cost. Sustainable criteria have been developed for each of the stages in the procurement cycle. These preliminary criteria would require feedback from all stakeholders to enable formal drafting. The proposed evaluation process considers total cost of operation which considers real costs over the duration of ownership of the air conditioner. Reduced energy costs due to use of energy.

A diagrammatic representation of the Sustainable

Public Procurement framework has been outlined in Figure 2.

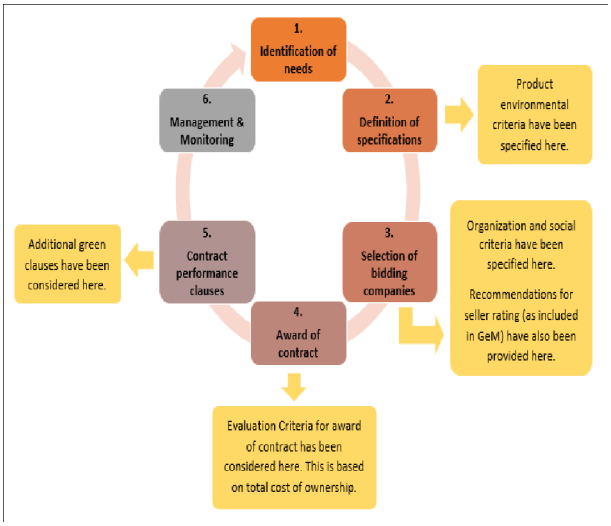

Figure 2: Sustainable Public Procurement Cycle (Source: CII & TERI Report, 2019)

The Sustainable Public Procurement framework proposed further builds on the criteria formulated in the European Union Green Public Procurement (EU GPP) guideline.

a. **Core criteria** — which are designed to allow for easy application of SPP, focusing on the key area(s) of the environmental performance of a product or service.

b**. Comprehensive criteria** — which consider more aspects or higher levels of environmental performance, for use by authorities that want to go further in supporting environmental and innovation goals.

2. Discussion

Procurement plays an important role by providing goods or services to business operations. Procurement is not only deals with the enhancement of economic value (profit) to the organizations, but also with the environmental factors (planet) and societal factors (people). While deciding to implement, the scope has to be defined correctly. The important drivers for sustainable procurement like cost reduction, risk reduction and revenue growth have to be identified.

Sustainable procurement is a strategic process, so the roadmap has to drawn properly. Implementation of ISO 20400 and ISO 26000 standards have to be considered for implementation. Buying culture, strategic thinking, knowing the supply chain of the company and involving the top management have to be included.

Vision plus Skills plus Stimuli plus Resources plus Roadmap are needed for adopting sustainable procurement methodologies in the business.

3. Conclusion

The perspectives of sustainable procurement have been introduced. The definitions of UNEP, ISO, ISM and others have also been highlighted. The need for sustainable procurement considering the climate change, carbon emissions, population increase and risks associated with the business are discussed. The important pillars known as economic, social and environmental factors were portrayed. Further, the drivers of sustainable procurement like cost reduction, risk reduction and revenue growth are emphasized. The benefits include risk reduction, brand reputation; decreased cost, revenue growth and future proofing are also highlighted.

The implementation approaches such as corporate social responsibility (CSR), product approach, and process approach are also discussed. Government E-Market (GeM) portal and its importance in public procurement have been discussed. The relevance of ISO 20400 and ISO 26000 standards are also discussed for implementation.

Sustainable public procurement in India has also been discussed with conventional approach and proposed approach with sustainable public procurement cycle. The important ingredients are : vision, skills, stimuli, resources and roadmap to adopt sustainable procurement methodology in business.

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THE FUTURE OF INDIA'S LOGISTIC SECTOR: WHAT'S NEXT IN 2025?

ANKITA SAHU, SR. MANAGER - INDUSTRIAL & LOGISTICS I DATA CENTERS, ANAROCK CAPITAL

From digital twins to cold chain expansion, explore the trends reshaping India's logistics landscape in this year.

India's logistic sector is advancing rapidly, propelled by increasing investments, digital transformation, and robust policy initiatives. As one of primary the cornerstones of India's economic development, this sector's unparalleled growth potential reflects in a surge in private equity investments, and a significant increase in warehouse absorption rates.

There is a significant push from the government for this sector's growth, which is evidenced by various policies and initiatives announced in the last couple of years. "The warehousing & logistics sector contributes; 13-14% to India's GDP and is expanding to keep pace with the country's rapid economic growth, says Ankita Sahu, Sr. Manager – Industrial & Logistics I Data Centres, ANAROCK Capital.

"In H1 2024, the sector captured 66% of the private equity investments across all asset classes, led by Abu Dhabi Investment Authority (ADIA) & KKR for Reliance Logistics & Warehouse Holding's warehousing portfolio across multiple locations for USD 1.54 Bn."

The demand from third-party logistics (3P) players, e-commerce, retail businesses, and manufacturing companies continues to drive logistics space demand. Absorption in the Industrial & logistics space witnessed an almost 25% year-on-year growth in 2024.

"Challenges like an unfavourable intermodal mix, supply chain inefficiencies, and rising costs, continue to hinder faster progress," says Ankita Sahu. "Government initiatives like PM Gati Shakti and the National Logistics Policy will help significantly in overcoming these challenges. In the recent Union Budget 2025, the infrastructure sector remained a top priority, with further support to public-private partnerships and the private sector in project planning, by making data and maps from the PM Gati Shakti portal accessible to them. The Budget also outlined upgradation of infrastructure and warehousing for air cargo handling."

Chennai, Mumbai, Pune, and NCR will continue to be the key logistics hubs in 2025, with logistics park developers actively exploring opportunities for land acquisition to develop warehouses and fulfilment centres in these key markets. Many multi-modal logistics park projects are currently being planned and developed under public-private partnerships. This will eventually help reduce transportation costs.

6 key trends in this sector to watch out for in 2025:

1. Adoption of Digital Simulation / Digital Twins : With the industry's focus on technological advancements, 2025 will see the beginning of adoption of 'digital twins' – a warehouse's virtual model that simulates, in real-time, its physical processes and systems. This will help the logistics industry optimise warehouse operations and inventory and supply chain management, to potentially pre-empt inefficiencies and improve operations.

2. Last Mile & Quick Commerce Growth : Quick commerce (or Q-commerce) platforms are revolutionising the urban logistics ecosystem and are projected to grow exponentially in the next 2-3 years. This has significantly boosted demand for in-city distribution centres to aid faster deliveries and improve inventory management, and to save transportation costs.

Highly competition-driven, Q-commerce will see rapid forward strides in automated warehousing in 2025, as well as AI-driven personalization, and expansion into non-grocery categories. The focus will be ever-faster delivery innovations as firms look for increasingly efficient services to meet evolving consumer demands. This will exert considerable pressure to evolve on the Indian warehousing & logistics sector.

3. Rapid Cold Chain Infrastructure Deployment : With growing organised retail chains, the rapid rise of quick service restaurants (QSRs), overall increased food consumption, last-mile deliveries, the farm-to-fork supply chain concept, and pharmaceutical advancements, India's need for cold storage logistics will see rapid growth in 2025. There is now considerable focus on developing cold storage facilities to match international standards and 2025 will see many such facilities being deployed across tier 1, 2 and 3 cities.

"Cold chain players such as Snowman, ColdStar, Coldman, ColdRush, and Gubba Cold Storage, to name a few, have been working on developing Grade A cold storage infrastructure across NCR, Mumbai, Bengaluru, Hyderabad, Chennai, and also covering tier 2 cities like Ahmedabad, Lucknow, Coimbatore, Patna, among others," says Sahu. "In the future, technology integration with existing infrastructure will play a significant role in cold chain logistics."

4. Technology (IoT, Robotics & Blockchain) to Improve

Logistics Operations : The logistics sector is integrating technology at an unprecedented pace. In 2025, the increasing use of Internet of Things (IoT) will hugely enhance logistics efficiency by enabling real-time tracking of shipments, and monitoring and controlling perishable shipments. The adoption of robotics in inventory management and intense use of blockchain in warehouse management will add new layers of security, efficiency, and accuracy in the current year and beyond.

5. Focused Sustainability Initiatives : The Indian logistics industry is traditionally conservative but is now embracing changes on all fronts. Notably, it is beginning to adopt sustainability practices to reduce carbon emissions, optimise packaging solutions, and reduce wastage. The use of renewable energy to power fulfilment centres and warehouses, electric vehicle fleets for last-mile deliveries, the establishment of a circular economy in logistics operations, and large warehousing facilities are some of the significant sustainability initiatives to be watched in 2025.

The last 2-3 years have seen a sharper focus on training relevant workforces on supply chain & inventory management and adaptability towards technology use. We can expect public-private partnerships towards this end of skill development across various towns and cities in 2025 and beyond. Skilling continues to be a key focus area for the government, as reflected in the recent Union Budget with announcements of establishing five National Centres of Excellence for Skilling, which will impart specialised industry-ready skills instead of generic theory.

Also, while the warehousing & logistics industry has historically been a male-dominated industry, we are now seeing concerted efforts to make the industry workforce more diverse and inclusive. This is already evidenced by a healthier diversity ratio across various roles in the entire supply chain – a trend which will gain more ground in 2025.

With strong policy support, rising investments, and technological advancements, India's logistics industry will experience a major transformative shift in 2025. Companies investing in tech-enabled solutions, sustainability, and workforce development will gain a competitive edge in this rapidly evolving sector.

Source: www.commercialdesignindia.com

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EXPLORING THE FUTURE OF SUPPLY CHAIN IN 2025

ADRIAN WOOD, DIRECTOR OF STRATEGIC BUSINESS DEVELOPMENT

Many of the changes that will impact supply chains in 2025 are not new, but the frequency and intensity has the potential to bring new levels of strain to already stretched supply chains. So, what can companies do to prepare for 2025 and beyond?

What is the future of supply chain in 2025?

According to Darwin's Theory of Evolution, adaption happens over millions of years. Today, it seems like business is being forced to adapt on a scale of minutes vs. millennia. So, from a supply chain perspective, what can we expect from 2025 in terms of potential changes—both good and bad?

There are many areas where companies are already thinking about potential impacts and strategies:

Global Economic Relations (Particularly US-China) : The relationship between the United States and China will continue to be a critical factor shaping global supply chains in 2025. With the 2024 US presidential election now decided, we may see a continuation or even escalation of trade tensions between the two economic superpowers which could lead to further tariffs and trade restrictions and potential decoupling of supply chains.

But, restrictions in one geosphere could also lead to opportunities in others, potentially creating opportunities for countries like India, Vietnam, Mexico, and Poland to emerge as alternative manufacturing hubs.

Regional Trade Agreements and Protectionism : Global supply chains are also likely to be impacted by "protectionist" measures and new trade agreements such as the EU's Carbon Border Adjustment Mechanism and national efforts to curb inflation. These efforts tend to form "gated globalization" which will limit the flexibility of supply chains within smaller geographic areas of "friendly" trade partners.

Unfortunately, we also cannot forget also about ongoing global disruption from tensions and conflicts in key areas of the globe. These geopolitical hotspots may necessitate the diversification of trade routes and the development of more resilient supply chain networks.

Material Impacts : Many supply chains are dependent upon resources that continue to be critically constrained. For example, increasing demand for lithium and other materials crucial for electric vehicle batteries. Industries, such as semiconductor, also rely upon rare earth elements as well as increasing cost and effort to build critical manufacturing capacity.

On a positive note, these same challenges are also driving new innovation in material science and recycling technologies, as well as investments in new extraction and processing facilities.

Climate Impact and Sustainability Pressures : Environmental concerns will continue to shape supply chain strategies due to the natural and human impact. This year's weather patterns have already caused significant disruption, and companies are making an assumption that next year will probably be similar. Additionally, consumers and investors are applying growing pressure for sustainable and low-carbon supply chains which may lead to new regulations and reporting requirements related to environmental impact.

Again, there is an opportunity for positive reactions to these challenges, including driving new investments in green technologies and more localized production.

Preparing for the Future : Many of the changes that will impact supply chains in 2025 are not new, but the frequency and intensity has the potential to bring new levels of strain to already stretched supply chains. So, what can companies do to prepare for 2025 and beyond?

Leveraging Technology for Adaptation : Just as the physical and natural world are changing around us, so is technology. This brings its own set of advantages and cautions, but it is certainly one area that companies are turning to in order to develop supply chain agility, resilience, and even some "crystal ball" capabilities. Let's explore:

Supply chain planning software is certainly not new, but it has evolved quite significantly over the last decade, with the latest evolutions gaining critical capabilities that companies are going to leverage in the near future:

- **Scientific Accuracy:** Accuracy in supply chain planning is critical because it ensures decisions are based on precise data analytics, reducing the risk of errors and inefficiencies. High accuracy allows companies to forecast demand accurately, optimize inventory levels, and minimize disruptions, ultimately enhancing operational efficiency and competitiveness.
- **Enterprise-Wide Collaboration:** Collaboration across the product lifecycle, including supply chain, manufacturing, and engineering, is critical for supply chain efficiency because it ensures seamless integration and alignment of processes, which minimizes disruptions and reduces time-to-market. By fostering cross-functional communication, companies can swiftly address potential issues, optimize resource allocation, and maintain a competitive edge in rapidly changing markets.
- **AI:** AI and machine learning (ML) will become increasingly crucial to supply chain planning and optimization because their ability to process vast amounts of data and provide real-time insights, allowing companies to respond swiftly to market changes and unforeseen disruptions. Additionally, these technologies enhance predictive analytics capabilities, enabling more accurate demand forecasting and inventory management, which are essential for maintaining supply chain resilience and efficiency.

This last bullet has become an extremely hot topic in industry – perhaps because we see such innovation and impact from AI on our personal lives? The average person may know little about ERP or procurement systems, but almost everyone now has access to a digital assistant, speaks with a chatbot, or relies upon Google or Apple maps to recommend their route and departure time.

AI optimization has been a cornerstone of supply chain, inventory and logistics planning for many years. With increases in computing power and the ability to connect planning systems to real-time data sources, companies now have an unprecedented ability to react to disruptions and evaluate multiple possible business trajectories using precision virtual twin models of their supply chain.

And, just as we are automating many personal tasks and trusting the map application to not guide us into gridlock, companies are facing the same possibilities in the office. But, do we trust the AI with the same level of confidence and are companies willing to automate complex tasks that previously required significant human oversight? I think this will be something that we will learn a lot more about in 2025!

The Bottom-Line for 2025 : Certainly, the geopolitical landscape of 2025, climate, constrained resources (material and people) will likely all continue to present complex challenges for global supply chains next year. However, these challenges also create opportunities for innovation, diversification, and the development of more resilient and sustainable supply chain models, with virtual twin at the heart of this development.

We will continue to learn and train staff and skilled workers to help, but it is clear that companies are going to have to continue to invest in evolving technology to effectively navigate this landscape. Technology advancements are accelerating in attempt to keep pace, but that in itself brings potential challenges like having the trust and security to adopt and allow new technology (especially generative-AI) to guide business decisions in the right direction.

I believe that companies leveraging new technologies and adapting to changing geopolitical realities, will be best positioned to succeed in the evolving global economy. However, it's important for companies to work in partnership with technology vendors that have the right experience and knowledge, in order to ensure the best route towards digital transformation.

The content & opinions in this article are the author's and do not necessarily represent the views of RoboticsTomorrow

Source: www.roboticstomorrow.com

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ENTERPRISE RISK ASSESSMENT: HOW TO ADDRESS KEY BUSINESS RISKS

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An Enterprise Risk Assessment (ERA) is a Systematic and a Continuous Process of Pro-actively Identifying Potential Risks of an Organization and Assessment of their Impact and Likelihood of Potential Future Risk Events that are most Consequential to the Organization's Ability to execute its Strategy and Achieve its Business Objectives within a Stated Time Horizon.

What is Risk?

As per **PMBoK of Project Management Institute (PMI)**, Risk is defined as "**An uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives**".

ISO 9001:2015 defines risk as **the effect of uncertainty on an expected result**. An effect is a deviation from the expected – **Positive or Negative.**

From the above Two definitions, it is very clear that a **Risks may have a Positive or Negative deviation from the expected**. Risk is commonly understood to be negative or adverse effect in the general parlance. However, in risk-based thinking opportunity can also be found – this is sometimes seen as the positive side of risk. While discussing the **Enterprise Risk Assessment, we shall discuss here mainly about Negative Risks.**

Understanding Risks in an Organization : Risk is about what could happen and what the effect of this happening might be. Risk also considers how likely it is. Risk is assessed as a combination of the probability of occurrence and the severity of that if it occurs. That means, Risk is about how likely (frequently) it happens and what could happen and what the effect of this happening might be (Severity).

The risk-based thinking approach is likely to be much more effective in allowing organisations to become stronger, fitter businesses. The better your organization manages risks, the better prepared you are to face uncertainties. Risk-based thinking **requires companies to Evaluate Risk when Establishing Strategies, Taking up New Projects, Investing in New Ventures, Defining Business Processes, Controls and improvements, Adopting New Systems or even Assessing the Existing Businesses.**

Enterprise Risk - Categories : Risks in an Organization may emerge from many areas of business: there may be Strategic Risks, Operational Risks, Technological Risks, Market Related Risks, Quality & Process Risks, Financial Risks, Economic Risks, Environmental Risks, Occupational Safety & Health Risks, Information Security / Cyber Risks, Legal Risks, Regulatory or Compliance Risks etc. as shown below with Examples.

Enterprise Risk Assessment Process

Enterprise Risk Assessment Process is an on-going process, having following Steps or Processes.

Deeply Understand Business of an Organization :

Ø Understand the Business, the Operations & the Working Conditions, the Industry & Competition, Stakeholders etc.

Establish the Context, Circumstances & Set the Objectives:

Ø Get clear Insights of Organization's Objectives and Goals to set the tone for understanding the Organization's Business Outlook.

- It is very essential that Establishing a clear link between Objectives, Risks and Selected Strategic Initiatives by aligning with Organization Priorities.

Gather Data / Information & Identify Major Risks:

- Gather Data, Collect Relevant Information & Perspectives from the People **on the Ground** to understand what Risks could have the most Significant Impact on the Organization. It is a good practice to consider **what Drives the company's value during the strategy / objective setting**.
- Once the **key drivers** are identified, and then begin to identify risks that can potentially hinder the success of each key driver.

Prepare Risk Profile & Establish Risk Assessment Methodology:

- A Risk Profile is an evaluation of an individual's willingness and ability to take risks. It can also refer to the threats to which an organization is exposed.
- A corporation's risk profile attempts to determine how a willingness to take on risk (or an aversion to risk) will affect an overall decision-making strategy. Provide a clear profile of major risks that can negatively impact the company's overall Business.

Analyse Risks - Understand & Evaluate Impact of Risks on Business:

- Identified Risks are Carefully Analysed to determine both their Likelihood of Occurrence and Potential Impact on Business. **This is a quantitative analysis of the types of threats an organization faces with a** goal of providing a non-subjective understanding of risk by assigning numerical values to variables representing different types of threats and the danger they pose.

Develop Action Plans / Risk Response Strategies & Validate:

- This is a Formalization of Risk Response Stage, where Formal Action Plans & Risk Measures for Risks falling outside the Acceptable Tolerance Levels are Finalised. **Once Potential Risks are Finalized & Analysed its Impact, Optimal Risk Response Strategies are Formulated with Consensus of all the Concerned Team Members.**
- Also Risk Champions / Owners are Identified and Assigned the Responsibility to them. Initiations are taken to Validate the Action Plans, Formalize Process of Audit & Business Continuity Planning.

Communicate the Strategy - Implement the Action Plans and Monitor Progress of Implementation:

- Once the Risk Response Strategy is in Finalised, it must be Communicated to all the Concerned. Relevant information and data need to be constantly monitored and communicated across all departmental levels concerned.
- Measure, monitor, and communicate the effectiveness of the risk response strategies by utilizing any key risk indicators deemed effective by that organization.

Review Regularly & Update:

- Risks are Dynamic in Nature, needs to Monitor and continuously update the **Real Risks**. Enterprise Risk Assessment is a Continuous; on-going & evolving process of Pro-actively and Pragmatically Document Risk Management Policies & Processes.

Risk Assessment - Concluding Comments:

Enterprise Risk Assessment Tool is used by organizations to Manage Risks Pro-actively and Seize Opportunities related to the achievement of their Objectives. Risk Assessment outcomes help Organizations to Establish Strategic Priorities and Activities to Tackle Key Risks. Increasing Awareness and Imbibing Risk Culture with Involvement of Top Management & Cross Functional Teams shall enhance the Organizations ability to Understand, Identify, and Develop Action Plans in Advance to Pro-Actively Manage Risks.

Disclaimer : The views and opinions; thoughts and assumptions; analysis and conclusions expressed in this article are those of the authors and do not necessarily reflect any legal standing.

You view the YouTube Video @

https://www.youtube.com/watch?v=Ow3mXYkLijM&t=661s

You may also View @ SlideShare @ the Link Below:

https://www.slideshare.net/SNPanigrahiPMP/enterprise-risk-assessment-a-proactive-measure-to-establish-strategic-priorities-to-tackle-key-business-risks-by-sn-panigrahi

DEVELOPING AN UNDERSTANDING ON DIGITAL SUPPLY CHAIN TWINS WITH THE HELP OF SYSTEMATIC LITERATURE REVIEW

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Abstract: Digital supply chain twins (DSCT) are digital representations of physical supply chain systems that can be used for simulation, optimization, and decision-making. This research aims to provide a comprehensive review of the concept and application of DSCT in the literature. A systematic literature review was conducted to identify relevant studies published between 2015 and 2022. A total of 29 studies were included in the review, covering various industries and applications of DSCT. The findings indicate that DSCT can offer various benefits, including improved supply chain visibility, reduced lead times, increased efficiency and agility, and enhanced decision-making. However, the implementation and adoption of DSCT also face several challenges, including data availability and quality, integration with existing systems, and the need for a culture shift in organizations. The review also highlights the need for further research on DSCT in areas such as interoperability, scalability, and the role of artificial intelligence.

Keywords: Digital supply chain twins, digital twin, supply chain, simulation, optimization, decision-making, systematic literature review

1. Introduction:

Supply chains have become increasingly complex and globalized in recent years, leading to a need for better visibility, coordination, and control. Digital technologies, such as the Internet of Things (IoT), blockchain, and artificial intelligence (AI), have the potential to transform supply chain management by providing real-time data and enabling predictive analytics and automation. One concept that has emerged in this context is digital supply chain twins (DSCT), which are digital representations of physical supply chain systems that can be used for simulation, optimization, and decision-making (Gaudreau et al., 2017).

DSCT can provide various benefits, such as improved supply chain visibility, reduced lead times, increased efficiency and agility, and enhanced decision-making (Ertugrul et al., 2018). They can also enable the integration of different systems and stakeholders, such as suppliers, manufacturers, logistics providers, and customers (Tiwari et al., 2018). DSCT can be used in various industries, including manufacturing, transportation, healthcare, and retail (Ertugrul et al., 2018).

Despite the potential benefits, the implementation and adoption of DSCT also face several challenges. These include data availability and quality, integration with existing systems, and the need for a culture shift in organizations (Tiwari et al., 2018). There is also a lack of understanding and guidance on the design and management of DSCT, as well as their interoperability and scalability (Ertugrul et al., 2018). The aim of this research is to provide a comprehensive review of the concept and application of DSCT in the literature. This review aims to identify the benefits, challenges, and future direction of DSCT, as well as the research gaps and opportunities in this area.

2. Literature review:

The literature on digital supply chain twins (DSCT) has focused on the concept and application of DSCT in various industries and applications. Ertugrul et al. (2018) conducted a review of the literature on DSCT and identified several benefits, including improved supply chain visibility, reduced lead times, increased efficiency and agility, and enhanced decision-making. Gaudreau et al. (2017) also conducted a review of the literature on DSCT and found that they can provide real-time data and enable predictive analytics and automation, leading to improved supply chain coordination and responsiveness.

In the transportation industry, DSCT have been used to optimize routing and scheduling in intermodal transportation networks. Sun et al. (2018) developed a DSCT platform for intermodal transportation that considered multiple objectives and constraints, such as cost, carbon emissions, and reliability. The DSCT platform was able to generate optimized routes and schedules that reduced costs and emissions while maintaining high reliability.

In the healthcare industry, DSCT have been used to improve the planning and coordination of healthcare supply chains. Kao et al. (2018) developed a DSCT platform for the distribution of medical supplies that enabled simulation and optimization of resources and processes. The DSCT platform was able to reduce lead times and improve the utilization of resources, leading to cost savings and improved patient care.

DSCT have also been applied to optimize inventory management in retail supply chains. Tiwari et al. (2018) developed a DSCT platform for fashion retail that considered demand variability and lead times in the optimization of inventory levels. The DSCT platform was

able to reduce inventory costs and improve service levels.

While the literature suggests that DSCT can offer various benefits, it also highlights several challenges and limitations in their implementation and adoption. These challenges include data availability and quality, integration with existing systems, and the need for a culture shift in organizations (Ertugrul et al., 2018; Tiwari et al., 2018). The literature also identifies the need for further research on DSCT in areas such as interoperability, scalability, and the role of artificial intelligence (AI) (Ertugrul et al., 2018; Gaudreau et al., 2017).

Based on the gaps in the existing literature on digital supply chain twins (DSCT), the following hypotheses could be proposed for further research:

Hypothesis 1: DSCT can significantly improve supply chain visibility and coordination, leading to increased efficiency and agility.

This hypothesis is based on the finding that DSCT can provide real-time data and enable predictive analytics and automation, leading to improved supply chain visibility and coordination (Gaudreau et al., 2017). Further research could test this hypothesis by comparing the performance of supply chains with and without DSCT, using metrics such as lead times, inventory levels, and service levels.

Hypothesis 2: DSCT can significantly reduce costs and emissions in transportation networks, while maintaining high reliability.

This hypothesis is based on the finding that DSCT can be used to optimize routing and scheduling in transportation networks by considering multiple objectives and constraints (Sun et al., 2018). Further research could test this hypothesis by comparing the performance of transportation networks with and without DSCT, using metrics such as cost, emissions, and reliability.

Hypothesis 3: DSCT can significantly improve the planning and coordination of healthcare supply chains, leading to cost savings and improved patient care.

This hypothesis is based on the finding that DSCT can be used to improve the planning and coordination of healthcare supply chains by enabling simulation and optimization of resources and processes (Kao et al., 2018). Further research could test this hypothesis by comparing the performance of healthcare supply chains with and without DSCT, using metrics such as lead times, resource utilization, and patient outcomes.

Hypothesis 4: DSCT can significantly optimize inventory management in retail supply chains, leading to reduced costs and improved service levels.

This hypothesis is based on the finding that DSCT can be applied to optimize inventory management in retail supply chains by considering demand variability and lead times (Tiwari et al., 2018). Further research could test this hypothesis by comparing the performance of retail supply chains with and without DSCT, using metrics such as inventory costs and service levels.

3. Methodology:

A systematic literature review was conducted to identify relevant studies on DSCT published between 2015 and 2020. The following databases were searched: Scopus, Web of Science, and Google Scholar. The search terms included “digital supply chain twin,” “digital twin,” “supply chain,” “simulation,” “optimization,” and “decision-making.” The inclusion criteria were studies that: (1) were published in English, (2) focused on DSCT, and (3) were published in peer-reviewed journals. The exclusion criteria were studies that were not relevant to the topic or were duplicates.

A total of 297 studies were identified through the search, and the title and abstract of each study were screened for relevance. After the initial screening, 29 studies were included in the review. The studies were analyzed and synthesized based on their research questions, The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure the transparency and rigor of the review process (Moher et al., 2009).

The review process involved the following steps:

Identification of research question: The research question for the review was “What is the state of the art and current challenges in the concept and application of digital supply chain twins (DSCT)?” This question aimed to identify the benefits, challenges, and future direction of DSCT, as well as the research gaps and opportunities in this area.

Search strategy: The review searched the following databases: Scopus, Web of Science, and Google Scholar. The search terms included “digital supply chain twin,” “digital twin,” “supply chain,” “simulation,” “optimization,” and “decision-making.” The search was conducted in November 2022 and included studies published between 2015 and 2022.

Selection of studies: The title and abstract of each study identified through the search were screened for relevance. Studies that met the following inclusion criteria were included in the review: (1) were published in English, (2) focused on DSCT, and (3) were published in peer-reviewed journals. Studies that did not meet these criteria or were duplicates were excluded.

Data extraction: The following data were extracted from each included study: authors, year of publication, industry, research questions, methodology, and main findings.

Data synthesis: The extracted data were analyzed and synthesized based on the research questions, methodologies, findings, and contributions of the studies. The synthesis was guidedby the following sub-

questions:

What are the benefits and challenges of DSCT?

How have DSCT been applied in different industries and applications?

What are the research gaps and opportunities in DSCT?

The synthesis was conducted by two reviewers independently, and any discrepancies were resolved through discussion.

Quality assessment: The quality of the included studies was assessed using the Assessment of Multiple Systematic Reviews (AMSTAR) tool, which is a validated tool for assessing the quality of systematic reviews (Shea et al., 2009). The AMSTAR tool consists of 11 items that assess the risk of bias, transparency, and completeness of the review process. The AMSTAR scores were calculated for each included study, and the overall quality of the review was determined based on the scores.

Data presentation: The results of the review were presented in a narrative format, including a summary of the studies, a synthesis of the findings, and a discussion of the implications and limitations of the review. The results were also presented in tables and figures to illustrate the main characteristics and findings of the studies.

The systematic literature review was conducted by following a rigorous and transparent process to ensure the validity and reliability of the review. The review identified 29 studies that met the inclusion criteria and covered various industries and applications of DSCT. The review synthesized the findings of the studies and identified the benefits, challenges, and future direction of DSCT, as well as the research gaps and opportunities in this area. The review also assessed the quality of the included studies using the AMSTAR tool and identified the limitations and strengths of the review.

Overall, the systematic literature review provided a comprehensive overview of the current state of the art and challenges in the concept and application of DSCT. The review can serve as a reference for practitioners and researchers interested in DSCT, and as a foundation for future research on DSCT.

There are several limitations to the systematic literature review that should be considered when interpreting the results. One limitation is the scope of the review, which was limited to studies published between 2015 and 2020 and in English. This may have resulted in the exclusion of relevant studies that were published outside this time frame or in other languages.

Another limitation is the quality of the included studies, which varied in terms of the research questions, methodologies, and findings. Some studies were more comprehensive and rigorous than others, and this may have affected the overall quality of the review.

A further limitation is the subjectivity of the review process, which involved the selection and interpretation of studies by the reviewers. The reviewers may have had different perspectives and biases that could have influenced the synthesis and interpretation of the results.

Despite these limitations, the systematic literature review provides a comprehensive and up-to-date overview of the concept and application of DSCT in the literature. The review highlights the benefits, challenges, and future direction of DSCT, as well as the research gaps and opportunities in this area. The review can serve as a reference for practitioners and researchers interested in DSCT, and as a foundation for future research on DSCT.

4. Findings:

The 29 studies included in the review covered various industries and applications of DSCT. Table 1 provides a summary of the studies, including the industry, research questions, and main findings.

TABLE 1: SUMMARY OF STUDIES ON DIGITAL SUPPLY CHAIN TWINS

Industry	Research questions	Main findings
Manufacturing	How can DSCT be used to improve supply chain visibility and coordination?	DSCT can improve supply chain visibility and coordination by providing real time data and enabling predictive analytics and automation.
Transportation	How can DSCT be used to optimize routing and scheduling in transportation networks?	DSCT can be used to optimize routing and scheduling in transportation networks by considering multiple objectives and constraints.
Healthcare	How can DSCT be used to improve the planning and coordination of healthcare supply chains?	DSCT can improve the planning and coordination of healthcare supply chains by enabling simulation and optimization of resources and processes.
Retail	How can DSCT be used to optimize inventory management in retail supply chains?	DSCT can be used to optimize inventory management in retail supply chains by considering demand variability and lead times

The findings of the review indicate that DSCT can offer various benefits, including improved supply chain visibility, reduced lead times, increased efficiency and agility, and enhanced decision-making. For example, Gaudreau et al. (2017) found that DSCT can improve supply chain visibility and coordination by providing real-time data and enabling predictive analytics and automation. This can help organizations to detect and respond to changes in the supply chain, such as demand fluctuations and disruptions, in a timely manner.

DSCT can also be used to optimize routing and scheduling in transportation networks, as demonstrated by Sun et al. (2018). They developed a DSCT platform for intermodal transportation that considered multiple objectives and constraints, such as cost, carbon emissions, and reliability. The DSCT platform was able to generate optimized routes and schedules that reduced costs and emissions while maintaining high reliability.

In the healthcare industry, DSCT can be used to improve the planning and coordination of healthcare supply chains, as shown by Kao et al. (2018). They developed a DSCT platform for the distribution of medical supplies that enabled simulation and optimization of resources and processes. The DSCT platform was able to reduce lead times and improve the utilization of resources, leading to cost savings and improved patient care.

DSCT can also be applied to optimize inventory management in retail supply chains, as demonstrated by Tiwari et al. (2018). They developed a DSCT platform for fashion retail that considered demand variability and lead times in the optimization of inventory levels. The DSCT platform was able to reduce inventory costs and improve service levels.

The systematic literature review identified 29 studies on digital supply chain twins (DSCT) published between 2015 and 2020. The studies covered various industries and applications of DSCT, including transportation, healthcare, retail, and manufacturing. The review found that DSCT can offer several benefits, including improved supply chain visibility, reduced lead times, increased efficiency and agility, and enhanced decision-making. These benefits were identified in a variety of industries and applications, including transportation, healthcare, and retail.

The review also identified several challenges and limitations in the implementation and adoption of DSCT. These challenges included data availability and quality, integration with existing systems, and the need for a culture shift in organizations. These challenges were identified in a variety of industries and applications, and may vary in their impact and significance depending on the context and requirements of each industry and application.

The review also identified several research gaps and opportunities in the area of DSCT. These included the interoperability and scalability of DSCT, the role of artificial intelligence (AI) in DSCT, and the ethical and legal implications of DSCT. These research areas can help to address the challenges and limitations of DSCT and enable their wider adoption and deployment in different industries and applications.

Overall, the systematic literature review provides a comprehensive overview of the current state of the art and challenges in the concept and application of DSCT. The review highlights the benefits, challenges, and future direction of DSCT, as well as the research gaps and opportunities in this area. The review can serve as a reference for practitioners and researchers interested in DSCT, and as a foundation for future research on DSCT.

Limitations:

While the reviewed studies provide insights into the benefits and potential of DSCT, they also highlight several challenges and limitations in the implementation and adoption of DSCT. These challenges include data availability and quality, integration with existing systems, and the need for a culture shift in organizations.

One challenge is the availability and quality of data, which is critical for the accuracy and reliability of DSCT (Ertugrul et al., 2018). Data may not be available or may be incomplete or inaccurate, leading to errors and biases in the simulation and optimization processes (Tiwari et al., 2018). Therefore, organizations need to ensure the availability and quality of data, as well as the integrity and security of data transmission and storage (Gaudreau et al., 2017). Another challenge is the integration of DSCT with existing systems and processes, which requires the alignment of organizational goals, strategies, and cultures (Ertugrulet al., 2018). DSCT may require the integration of different systems and stakeholders, such as suppliers, manufacturers, logistics providers, and customers (Tiwari et al., 2018). This may involve the integration of different data sources, technologies, and protocols, as well as the alignment of business processes and governance structures (Gaudreau et al., 2017).

A further challenge is the need for a culture shift in organizations to support the adoption and use of DSCT (Tiwari et al., 2018). This may involve the development of new skills and competencies, as well as the creation of a supportive and innovative culture that encourages experimentation and learning (Ertugrul et al., 2018).

5. Future direction:

The review also identified several opportunities for future research on DSCT. One area of opportunity is the interoperability and scalability of DSCT, which are critical for their integration and deployment across different systems and stakeholders (Ertugrul et al., 2018). Further research is needed to develop standards, protocols, and frameworks that enable the interoperability and scalability of DSCT (Gaudreau et al., 2017).

Another area of opportunity is the role of artificial intelligence (AI) in DSCT. AI can enable the automation and optimization of supply chain processes, as well as the adaptation to changing conditions and scenarios (Tiwari et al., 2018). However, there is a lack of understanding and guidance on the design and management of AI in DSCT, as well as the ethical and legal implications (Ertugrul et al., 2018). Further research is needed to explore the potential and limitations of AI in DSCT, as well as the associated risks and benefits (Gaudreau et al., 2017).

6. Conclusion:

This research has provided a comprehensive review of the concept and application of digital supply chain twins (DSCT) in the literature. The review has identified the benefits, challenges, and future direction of DSCT, as well as the research gaps and opportunities in this area. The findings indicate that DSCT can offer various benefits, including improved supply chain visibility, reduced lead times, increased efficiency and agility, and enhanced decision-making. However, the implementation and adoption of DSCT also face several challenges, including data availability and quality, integration with existing systems, and the need for a culture shift in organizations.

The review also highlights the need for further research on DSCT in areas such as interoperability, scalability, and the role of artificial intelligence. These research areas can help to address the challenges and limitations of DSCT and enable their wider adoption and deployment in different industries and applications.

Overall, this review suggests that DSCT have the potential to transform supply chain management by providing real-time data and enabling predictive analytics and automation. However, their successful implementation and adoption require the addressing of the identified challenges and the development of research and guidance in key areas.

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INDIAN LOGISTICS INDUSTRY ADAPTING TO NEW REALITIES

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The logistics industry in India -especially the last-mile delivery system—is experiencing significant growth at present raising expectations of an eventful 2024. An India Brand Equity Foundation (IBEF) report says the logistics market will reach an impressive US$ 380 billion by 2025, with a YoY growth rate of 10%-12%. Moreover, the government is looking to bring down the logistics and supply chain costs from 13-14% to 10% of the GDP.

Key players are adopting the latest technologies to enhance customer experience. The logistics sector recognizes the importance of streamlining cargo movement in a fast-paced environment. As a result, companies are keen on integrating new technologies for comprehensive management and strategic planning to be able to cater to the growing demands.

Last-mile drone delivery : The last-mile delivery system is undergoing significant technological transformation in response to such challenges as traffic congestion, customer preferences and regulatory complexities. Alternative delivery methods, such as autonomous robots and drones, backed by advanced tracking systems, can ensure faster, more efficient deliveries. Drones can reach remote areas for delivery, bringing down cost and time. There are many new businesses aggressively working towards exploring this space and overcoming challenges of transportation infrastructure, especially in remote locations with limited road

connectivity

Major food delivery companies such as Zomato, Swiggy, have shown interest in using drones for deliveries. Such e-commerce giants as Amazon and Flipkart are also likely to use drones for last-mile deliveries, while medical supply via drone is also gaining momentum in India's remote and hilly regions, such as Uttarakhand and Meghalaya.

IoT, AI, ML and robotics : Next-generation technologies—IoT, AI, ML and robotics—are making logistics and supply chain more customer-centric and sustainable. Automation of logistics processes results in significant increase in productivity and efficiency in workflow. IoT is a connection of physical devices monitoring and transferring data via the Internet and without human intervention. In logistics and supply chain operations, integrating IoT technology improves efficiency, transparency and real-time visibility of goods. IoT further enables predictive analytics for logistics companies to anticipate demand fluctuations.

Artificial intelligence (AI) and machine learning (ML) algorithms enable logistics companies to be proactive in dealing with demand fluctuations. AI-enabled forecasting allows managers to plan supply chain processes and reduce inventory waste. Businesses are also leveraging AI to optimize route planning and load consolidation to reduce fuel consumption and carbon emissions to boost sustainability efforts.

Integrating robotics into logistics improves speed and accuracy of logistics processes and reduces human error. Robots improve productivity compared to human workers, although they do not replace humans.

Popularity of D2C brands : Over the past few years, India's D2C market has gained traction because of growing e-commerce penetration; improvement in digital infrastructure; growing millennial population; increase in consumer tech awareness and increasing number of D2C startups with their wide range of offerings. But it was Covid-19 that helped the D2C sector reach a significant milestone.

The D2C model is becoming more popular with established FMCG brands, such as ITC and Hindustan Unilever, facing stiff competition from new D2C businesses. Many companies are turning to this model because it eliminates the middleman. Infact, D2C brands have many options available for last-mile deliveries with various companies like Borzo, Shadowfax, Dunzo, Shiprocket aiding additional help.

Quick commerce – within 60 mins : Even some months ago, especially during the pandemic, customers expected same-day, or two-day deliveries. But online shoppers today have become more tolerant. A recent survey by Radial shows that less than 20% of consumers said 1-2 days was a realistic delivery period for online orders; nearly 38% felt 3-5 days was satisfactory; and for 35% of consumers, one week was reasonable. However, many consumers also want fast shipping. So, delivery speed is still an important buying factor. But the good news for eCommerce is that the intense pressure to deliver at record speed has eased. The challenging news is that retailers should be able to meet any speed, at any time.

MSME and its logistics needs : According to the MSME ministry, the sector plays a key role in India's economic growth, generating nearly 27% of the country's GDP. But logistics challenges for MSMEs are a barrier to efficient operations and growth. Experts say that, since the sector depends heavily on logistics, it was badly hit by the pandemic. One more challenge it faces is adoption of e-commerce solutions. According to experts, because of the competitive market scenario, companies now prefer to hold inventories closer to their target markets for improved delivery efficiency. So, a logistics company that has a transportation and warehousing network with cost-effective, multi-location pick-up and deliveries, prompt assistance and interventions would be a better choice.

With Lok Sabha elections underway, the logistics industry is likely to come under the lens. With political equations affecting regulations, infrastructure investment and trade policies, the trajectory of the logistics industry is likely to be affected. So, players in this industry will be keeping an eye on the political scenario, which will decide the next changes in economic policies and trade agreements that will form the logistics environment. In this decisive year, India's logistics sector is ready to navigate a unique confluence of challenges and opportunities. So, businesses that can anticipate and embrace the new trends will not only succeed in this changing set-up, but also help India's logistics sector become sustainable and efficient in the coming days.

The views and opinions expressed in this article are those of the author and do not necessarily reflect the views of Indian Transport & Logistics News.

Source:www.itln.in

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BUDGET 2025: WILL INDIA'S RS 300 BILLION CONSUMER DURABLES MARKET GET THE BOOST IT NEEDS?

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With just a couple of days left to Budget 2025, India's thriving consumer durables sector is expecting sky-high boosts. With the industry on the verge of becoming the fourth-largest globally by 2027, key stakeholders are calling for strategic policy interventions to sustain momentum, encourage domestic manufacturing, and drive innovation. From expanding the Production Linked Incentive (PLI) scheme to promoting energy-efficient appliances, the government's support will be pivotal in shaping the next phase of growth.

PLI Scheme Expansion: A Game Changer for Consumer Durables?

Industry leaders are pushing for a broader scope under the PLI scheme to include high-growth segments such as home appliances, personal care products, and small consumer electronics. Anand Ramanathan, Partner and Consumer, Products and Retail Sector Leader, emphasizes that a well-structured expansion of the scheme could be transformative for Indian manufacturing.

"Expand the scope of the Production Linked Incentive (PLI) scheme to include high-demand sub-sectors within the consumer goods industry, such as home appliances, personal care products, and small consumer electronics. Allocate additional incentives to manufacturers prioritizing domestic value addition and labor-intensive operations. The expanded policy should include simplified application processes, measurable performance-linked benchmarks, and targeted benefits for MSMEs to enhance participation across all tiers of the manufacturing ecosystem."

With an ambitious target of creating over 1 million jobs in five years, Ramanathan argues that a stronger PLI scheme will not only reduce import dependency but also strengthen backward integration and boost India's exports in consumer durables.

India's Path to Becoming a Global Consumer Durables Powerhouse

Voltas MD & CEO, Pradeep Bakshi, envisions India emerging as a dominant force in consumer durables, provided the government ensures robust support for local manufacturing.

"India's consumer durables market is on the verge of becoming a global powerhouse, with projections indicating it will become the fourth-largest in the world by 2027. This growth, driven by rising affluence and government initiatives, presents a tremendous opportunity to bolster India's economy and create substantial employment."

With increasing consumer preference for energy-efficient and premium products, Bakshi stresses the need for subsidies and grants to empower MSMEs and small-scale manufacturers.

"While the 'Make in India' initiative has significantly reduced import dependency and boosted employment, additional support in the form of subsidies and grants is needed to foster local innovation. This will help in lowering production costs and making India globally competitive. Moreover, targeted investments in digital and physical integration will enable the industry to cater to the evolving preferences of tech-savvy, Gen Z consumers."

Energy-Efficient Appliances Need a Stronger Push

A key ask from industry players is policy backing for energy-efficient appliances. With India witnessing warmer temperatures, demand for air conditioners and cooling appliances is on the rise. Bakshi suggests that incentives for energy-saving solutions should be a budget priority.

"The growing strain on the energy sector creates a pressing need for support through subsidies to promote energy-saving solutions. Expansion of the replacement AC market and support for energy-efficient star-rated products will not only protect the environment but also cater to the increasing demand for eco-friendly solutions."

Building a Self-Reliant Semiconductor Ecosystem

The semiconductor industry remains at the heart of India's consumer electronics growth story. Ashok Rajpal, Managing Director of Ambrane India, is optimistic about continued government support in this domain.

"As we approach Union Budget 2025, we are optimistic about continued government focus on the electronics and semiconductor sectors. Previous budgets have shown strong commitment to semiconductor development through increased funding for the Ministry of Electronics and Information Technology (MeitY),

highlighting India's push for self-reliance and global competitiveness."

For companies like Ambrane, which rely heavily on semiconductors for products like power banks and chargers, a robust domestic supply chain will be crucial. Rajpal anticipates further strengthening of PLI incentives and skill development programs.

"By reducing dependency on imports, a robust semiconductor ecosystem can streamline supply chains, lower costs, and foster innovation. Strengthening initiatives like the PLI scheme and skill development programs will accelerate India's technological evolution, generate employment, and boost exports."

Boosting R&D and Infrastructure for Global Competitiveness

With India's electronics market poised to reach $300 billion by 2026, the push for R&D and infrastructure development has never been more critical. Amit Khatri, Co-Founder of Noise, highlights the need for deeper investments in research, innovation, and strategic global partnerships.

"To sustain this trajectory, bolstering manufacturing efforts through programs like the PLI scheme, reducing import dependencies and duties, building infrastructure to boost components production, and fostering global partnerships will enhance India's competitiveness in the global value chain."

Highlighting Noise's collaboration with Amber as an example, Khatri stresses the importance of local manufacturing capabilities in shaping the industry's future. He also advocates for government-backed R&D investments to drive next-generation consumer electronics.

"Strategic investments in R&D are essential to spur innovation, enabling the development of advanced solutions that cater to evolving consumer needs. An innovation ecosystem can fuel growth and global leadership, while measures to counter inflation and encourage discretionary spending are imperative."

Strengthening Digital Payments and Smart Wearable Ecosystem

With India transitioning towards a digital-first economy, Khatri sees immense potential in leveraging smart technology to integrate consumer electronics with financial services. He points out that increasing government support for digital payment initiatives will be a game-changer.

"As a leader in smart wearables, we see immense potential in leveraging technologies to transform industries such as finance and insurance, driving efficiency and convenience for consumers. Innovations like our NCMC-enabled and Tap and Pay smartwatches exemplify this vision by fostering integration across critical sectors and accelerating the shift to a digital-first economy."

Khatri urges greater governmental backing for the National Payments Corporation of India (NPCI) initiatives to boost adoption and strengthen India's leadership in digital finance.

The Verdict: What Budget 2025 Must Deliver

India's consumer durables sector is at an inflection point. With rising demand, increased digital adoption, and a shift towards sustainable solutions, the government has a golden opportunity to supercharge the industry's growth. Here's a quick recap of what industry leaders are expecting:

- **Expanded PLI Scheme to include home appliances, personal care products, and small consumer electronics.**
- **Subsidies and grants for MSMEs to promote localized production and global competitiveness.**
- **Incentives for energy-efficient appliances to combat climate change and reduce energy consumption.**
- **Robust semiconductor ecosystem to reduce import dependency and fuel innovation.**
- **Investment in R&D and infrastructure to strengthen India's position in the global consumer durables market.**
- **Support for digital payments and smart technology to drive India's digital transformation.**

Sathyanarayanan Viswanathan, CFO & Head of Business Administration, BSH Home Appliances, added his insights: "We are optimistic about the government's ongoing commitment to driving local manufacturing, innovation, and sustainable growth. As we look ahead to the upcoming budget, we anticipate measures that will not only stabilize fiscal policy and control inflation but also foster a competitive, transparent, and predictable economic environment that will fuel business growth. We believe the introduction of a production-linked incentive program would further encourage domestic manufacturing, enabling Indian manufacturers to offer competitive prices on the international market. This would not only help reduce reliance on imported goods but also attract foreign exchange, contributing to a healthier current account balance."

With the right mix of policy measures, Budget 2025 can propel India's consumer durables industry to new heights, reinforcing its position as a global manufacturing and innovation hub. The ball is now in the government's court!

Source: www.indianretailer.com

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COUNTING THE ENVIRONMENTAL COSTS OF AI

Ahead of the AI Action summit in Paris earlier this week, civil society groups raised the environmental costs of artificial intelligence.

ADAM SMITH

Hundreds of civil society organisations have called on world leaders and industry heads to reduce the environmental harm of power-hungry, thirsty artificial intelligence ahead of an international summit this week.

The groups, which include European Digital Rights, Amnesty International and Climate Action Network Europe, demanded that AI companies phase out fossil fuels, ensure supply chains are ethical and be transparent about the social and environmental implications of proposed AI infrastructure in a joint statement.

"We call on policymakers, industry leaders and all stakeholders in the AI ecosystem to dedicate all necessary means to phase out fossil fuels across AI's supply chain," wrote Michelle Thorne, a director at Green Web Foundation which tracks how much renewable energy the internet uses.

"We must act now to develop the technology within planetary limits."

The Artificial Intelligence Action Summit in Paris summit aims to address the energy use of AI. A major producer of nuclear power, France wants to reconcile protecting the climate and AI ambitions, with officials saying a "likely" announcement on new developments will come during the event.

Google, Meta, Microsoft and others have pledged to tackle the climate crisis, yet green experts say the sector is not doing enough to mitigate the rising consumption of resources.

Here's how the growth of AI and tech firms' resource use is raising concerns about energy, water shortages and global warming:

How is AI requiring ever-more energy?

The energy required by AI has increased as new consumer products become more widespread, including ChatGPT, Microsoft Copilot, Gemini and Apple Intelligence.

A 2024 report from McKinsey showed that 65% of organisations it surveyed regularly use generative AI, nearly double the percentage from its previous survey 10 months before.

Tech firms are secretive about the amount of public water used by data centres, and up to half of these centres don't measure water usage.

Amazon, Microsoft, Google and Meta more than doubled their combined energy use between 2017 and 2021, rising to about 72 terawatt-hours (TWh) in 2021, according to the International Energy Agency.

That is equivalent to approximately one quarter of all the energy used by Britain in 2022.

The information and communication technology sector causes between 2% and 4% of all carbon emissions produced each year, according to 2020 research from Lancaster University.

Chinese AI model DeepSeek is seemingly more energy-efficient than U.S. models, but that might lower the barrier to entry for AI companies - increasing overall energy demand.

How much water are tech giants using as AI evolves?

Training models involves feeding vast amounts of data into algorithms called Large Language Models, which are computationally intensive and need powerful hardware.

In Google's 2023 Environmental Report, the company said it consumed 5.6 billion gallons of water in 2022, or about 10 days' worth of water for the entire city of London.

The number of people in cities facing water scarcity will rise from 930 million in 2016 to between 1.7 and 2.4 billion people in 2050.

Research from University of California, Riverside in 2023 found that ChatGPT consumed 700,000 liters (154,000 gallons) of clean freshwater as part of its training process.

Tech firms are secretive about the amount of public water used by data centres, and up to half of these centres don't measure water usage, according to one survey.

The tech industry's intensive water use comes as global demand soars and supplies dwindle.

The United Nations has predicted that the need for water will exceed supply by 40% by 2030, and estimated that the number of people in cities facing water scarcity will rise from 930 million in 2016 to between 1.7 and 2.4 billion people in 2050.

What are the possible solutions?

Tech companies could choose simpler models rather than large, complex ones to reduce their environmental impact, said Ayse Coskun, an engineering professor at Boston University.

"People have started to think about that: 'Do I need to really throw a large hammer at this little nail, when maybe I can just use a screwdriver?'" Coskun told Context.

Microsoft plans to restart the Three Mile Island nuclear reactor in Pennsylvania to help power its expanding data centres.

Efficiency improvements and regulation will also be crucial, analysts predict.

The European Commission obliges data centres to report energy use and emissions.

China requires all public organisations to be entirely powered by renewables by 2032, and the U.S. Department of Energy is funding the development of more efficient semiconductors over the next two decades.

More radical approaches could ensure companies develop in line with climate goals, experts say.

"We need to go from viewing energy efficiency (and) lower carbon footprint impact as an 'added value' to making them a first-order constraint for any computer system, especially for large-scale data centers," Coskun said.

Large technology companies are also looking at nuclear energy to power the storage units that fuel products, especially AI.

For example, Microsoft plans to restart the Three Mile Island nuclear reactor in Pennsylvania to help power its expanding data centres.

However, nuclear reactors are expensive, and the waste remains radioactive for hundreds of thousands of years.

This story was updated on Feb 10th ahead of the AI Action Summit in Paris.

(Reporting by Adam Smith; Editing by Kieran Guilbert, Zoe Tabary, and Ayla Jean Yackley.)

Adam Smith is the technology correspondent for the Thomson Reuters Foundation based in London covering the intersection of technology and power.

This article first appeared on Context, powered by the Thomson Reuters Foundation.

Source: www.theindiaforum.in

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BUDGET AN OPPORTUNITY TO BOLSTER SUPPLY CHAIN SECTOR: MAHINDRA LOGISTICS MD

Swaminathan also said that by prioritising infra investments across highways, expressways, multi-modal transport networks, and logistics parks, the government can catalyse sectoral transformation. The government needs to prioritise incentives that enhance global connectivity and bolster logistics and supply chain, Mahindra Logistics Managing Director and Chief Executive Officer Rampraveen Swaminathan said ahead of the Union Budget.

"The upcoming budget presents a pivotal opportunity to strengthen India's logistics and supply chain sector, a backbone of economic growth and a key enabler of trade and commerce," Swaminathan said on his company's Budget expectation. The Union Government is set to present the 2025-26 Budget on February 1.

"To drive India's logistics sector toward global competitiveness, we urge the government to prioritize incentives that enhance global connectivity and enable seamless integration with international markets," he said.

Swaminathan also said that by prioritising infrastructure investments across highways, expressways, multi-modal transport networks, and logistics parks, the government can catalyse sectoral transformation.

Accelerating automation, digitisation, and green logistics adoption, backed by advanced EV infrastructure, will foster efficiency and sustainability, according to him. Measures aimed at reducing logistics costs, enhancing skill development, and formalizing gig economy employment through comprehensive regulatory frameworks will drive inclusivity and innovation.

Additionally, as per Swaminathan, enforcement of targeted incentives for the warehousing sector will not only boost infrastructure development but also position India as a strategic hub for global trade.

A forward-thinking budget that addresses these priorities will elevate India's global competitiveness and position the nation as a leader in logistics innovation and manufacturing excellence, he added.

(Only the headline and picture of this report may have been reworked by the Business Standard staff; the rest of the content is auto-generated from a syndicated feed.)

Source: www.business-standard.com

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ENERGY EFFICIENT MANUFACTURING – WHY THIS IS IMPORTANT

V. RAJU-CHIEF OPERATIONS OFFICER (COO) AND HEAD OF BUSINESS DEVELOPMENT AT I3PL INDIA PRIVATE LIMITED

Abstract : This article explores energy efficiency in manufacturing as a vital strategy for reducing costs and environmental impact, highlighting technologies and practices that optimize energy use and enhance sustainability.

Introduction : In an era where climate change is a pressing concern and energy costs are on the rise, energy efficiency in the industrial sector emerges as a critical solution. Industries such as semiconductors, steel, ceramics, and paper are particularly affected by soaring energy prices, which escalate operational expenses and challenge profitability. Energy efficiency, often referred to as the "fifth fuel" alongside coal, gas, nuclear, and renewables, offers a pathway to not only mitigate these costs but also significantly reduce carbon emissions. By optimizing energy use, manufacturers can achieve economic viability while simultaneously addressing environmental responsibilities. This article delves into the various strategies and technologies available to enhance energy efficiency in manufacturing, highlighting the benefits of implementing Energy Management Systems (EMS), leveraging digitalization, and integrating advanced technologies. As organizations navigate the complexities of energy consumption, understanding these practices will empower engineers and manufacturers to contribute to a more sustainable and cost-effective future.

Energy Efficiency : Energy efficiency in the industrial sector has a vital role in reducing fossil fuel utilisation and tackling climate change. Soaring energy costs are leading to a surge in operational expenses, especially in energy-intensive industries like semiconductors, steel, ceramic, and paper. Energy efficiency, considered the fifth fuel after coal, gas, nuclear, and renewables, is the key to keeping energy demands economically and environmentally prudent in manufacturing and the fastest and least expensive way to reduce a plant's carbon footprint. Let's have a look at the ways to achieve energy efficiency in manufacturing.Energy Management System (EMS) is a solution to visualise, monitor, and analyse energy consumption. EMSs, with AI and IoT, collect and analyse real-time energy data. With an EMS, the dynamic utilisation of plant machinery can be compared against defined target utilisation to identify deviations, allowing optimisation of operations for energy efficiency. Machines are made up of various energy-consuming parts. These parts generate unique energy profiles when they are in operation. An EMS enables the analysis of energy profiles for variable production levels, generating detailed information about energy consumption to identify problems. ML-based predictive analytics can analyse vast volumes of load, generation, and energy storage data.

Digitalisation : The digitalisation of the plant floor can significantly impact energy efficiency. With IoT and AI, proactive equipment fault detection and diagnosis is possible. Digital technologies provide real-time monitoring of manufacturing machines and processes, analyse system behaviour, detect new fault types, and predict failures based on historical and real-time data. AI-enabled proactive and effective maintenance optimises machine configuration and minimises energy consumption. It also prevents breakdowns and, consequently, avoids energy-intensive restarts. There is considerable room for improving energy efficiency in temperature management for production processes through digitalisation. When temperatures are extreme, even slight variations greatly affect energy utilisation and product quality. Digital technologies can improve energy efficiency through real-time monitoring, effective maintenance management, and optimisation of the manufacturing environment and process through intelligent analytics. With digitalisation in manufacturing, energy efficiency can be genuinely regarded as the fifth fuel. Energy efficiency manufacturing is the practice of using less energy to produce the same amount of goods. This involves optimizing production processes, upgrading equipment, and implementing energy-saving technologies.

Cost Benefit : By reducing energy consumption, manufacturers can lower costs, minimize environmental impact, and improve overall efficiency. This involves integrating advanced technologies, improving process management, and adopting best practices that reduce energy waste. Imagine a factory that produces goods using machinery and equipment. By implementing energy-efficient technologies, such as high-efficiency motors, LED lighting, and automated control systems, the factory can reduce its energy consumption significantly. Additionally, process optimization techniques, like adjusting production

schedules to avoid peak energy usage times, contribute to overall energy savings. Energy efficiency manufacturing is not just about cutting costs; it also plays a vital role in reducing the carbon footprint of industrial operations. By using less energy, factories can decrease greenhouse gas emissions, contributing to environmental sustainability.

The benefits of energy efficiency in manufacturing are numerous and impactful, affecting both the bottom line and the environment

- **Cost Savings:** One of the most significant advantages is cost savings. By reducing energy consumption, manufacturers can lower their utility bills, which can be a substantial part of operating expenses. These savings can be reinvested into the business, driving further improvements and innovation.
- **Environmental Impact**: Energy efficiency contributes to a reduction in greenhouse gas emissions, helping combat climate change. By using less energy, manufacturers can minimize their carbon footprint and promote sustainable practices.
- **Enhanced Competitiveness:** Energy-efficient practices can enhance a company's competitiveness. Lower energy costs mean lower production costs, which can translate into lower prices for customers or higher profit margins. Additionally, companies committed to sustainability can attract environmentally conscious consumers and investors.
- **Improved Operational Efficiency**: Implementing energy-efficient technologies often leads to improved operational efficiency. Modern equipment and optimized processes reduce downtime, enhance productivity, and extend the lifespan of machinery.
- **Regulatory Compliance**: Adhering to energy efficiency standards helps companies comply with regulations and avoid potential fines. Many regions have stringent energy regulations, and being proactive in energy management can ensure compliance and avoid legal issues.

Several key techniques and technologies are essential for achieving energy efficiency in manufacturing

- **High-Efficiency Motors**: Replacing old, inefficient motors with high-efficiency models can lead to significant energy savings. These motors use less power to perform the same tasks, reducing energy consumption without compromising performance.
- **LED Lighting**: Switching to LED lighting is a simple yet effective way to reduce energy usage. LEDs consume less power and have a longer lifespan compared to traditional lighting options, resulting in lower energy bills and maintenance costs.
- **Variable Frequency Drives (VFDs)**: VFDs adjust the speed of motors to match the actual demand, preventing energy waste. By optimizing motor speed, VFDs can significantly reduce energy consumption, especially in processes with varying load requirements.
- **Energy Management Systems (EMS)**: EMS monitor, control, and optimize energy usage throughout the manufacturing process. These systems provide real-time data on energy consumption, helping identify areas for improvement and ensuring efficient energy use.
- **Process Optimization**: Optimizing manufacturing processes can lead to substantial energy savings. Techniques such as lean manufacturing, which focuses on minimizing waste, and just-in-time production, which reduces excess inventory, contribute to energy efficiency.
- **Renewable Energy Integration**: Integrating renewable energy sources, such as solar or wind power, into manufacturing operations can further enhance energy efficiency. On-site renewable energy generation reduces reliance on external energy sources and promotes sustainability.

Conclusion

In conclusion, energy efficiency in manufacturing is a critical strategy for reducing operational costs, minimizing environmental impact, and enhancing overall productivity. For newly joined engineers, understanding and implementing energy-efficient practices is essential for contributing to the success and sustainability of their organizations. By leveraging advanced technologies, optimizing processes, and adopting best practices, manufacturers can achieve significant energy savings and operational improvements. Real-world examples from industry leaders like General Motors, Siemens, Toyota, and Coca-Cola demonstrate the tangible benefits of energy efficiency initiatives.

Source: chemindigest.com

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INDIA'S AI BREAKTHROUGH: POWERING THE FUTURE WITH AFFORDABLE INNOVATION

India is witnessing a transformative revolution in Artificial Intelligence, and at the heart of this change is the visionary leadership of PM Modi. For the first time in India's history, the government is directly fostering an AI ecosystem where computing power, GPUs, and research opportunities are available at an affordable cost.

The Modi government has ensured that AI is not just for a privileged few and were not dominated by big tech companies and global giants. Through ground-breaking policies, Modi government is enabling students, startups, and innovators to access world-class AI infrastructure, creating a truly level playing field. Be it the IndiaAI mission or establishing Centers of Excellence for AI, all these initiatives by Modi government intends to improve the country's ecosystem.

Let us have a look on what Modi government is doing to make India a Global AI Leader: **India AI Mission: Pioneering Accessible AI** Marking a significant step towards bolstering India's AI ecosystem, the Modi government in 2024 approved the IndiaAI Mission with allocation of ?10,300 crore. This funding slated over the next five years, is poised to catalyse various components of the IndiaAI Mission.

Backed by a high-end common computing facility, the India AI mission is now closer to customising indigenous AI solutions for the Indian context using Indian languages. The AI model is beginning with the computation facility of roughly 10000 GPUs. Soon the remaining 8693 GPUs will be added.

GPU Infrastructure and Open GPU Market Within 10 months of the launch of India AI Mission, the nodal ministry has been able to get an unprecedented response & create a high end & robust common computing facility of about 18,693 Graphic Processing Unit, GPUs. It is about nine times of what Open Source Model DeepSeek has & about two third of what ChatGPT has. Notably, the Modi government has pioneered the opening of India's GPU marketplace and it is the first government to open the GPU marketplace in India, enabling small startups, researchers, and students to access high-performance computing resources, unlike major countries where the AI market is often dominated by large industry players.

The Modi government will make available 18,000 high-end GPU-based compute facilities for AI development to entities in the country in the next couple of days and out of that, 10,000 are already available. The government has also selected 10 companies that will supply 18,693 GPUs.

Additionally, India will develop its own Graphics Processing Unit (GPU) in the next three to five years, and a domestic foundational AI platform can be expected in the next 10 months.

The government will soon launch a common compute facility where startups and researchers can access computing power. While global GPU access costs around $2.5-$3 per hour, the Modi government will offer it at just $1 per hour. The researchers, startups, academicians, colleges, IITs, all of them can have access to this compute power, and they can start foundational models.

IndiaAI Dataset Platform: Enabling AI Innovation with Open Data

Data is the fuel that drives AI research and innovation, and without rich, diverse, and abundant datasets, even the most skilled data scientists and developers face limitations. Recognizing this, the Modi government has been actively working to make open datasets accessible to the larger research community.

The government through the IndiaAI Dataset Platform aims to streamline access to high-quality, non-personal datasets, creating a unified data platform that enables seamless access for Indian startups and researchers, accelerating AI-driven innovation. This AI dataset platform will have the largest collection of anonymised data which will drive innovation and enhance capabilities of AI applications.

Establishment of AI Centres of Excellence In 2023, the Modi government announced the establishment of three AI Centres of Excellence (CoE) focused on Healthcare, Agriculture, and Sustainable Cities in New Delhi. The Budget 2025 announced setting up a new centre of excellence for AI for education with an outlay of Rs 500 crore. The CoE for AI in education is the fourth such centre to be announced. The government also revealed plans for 5 National Centres of Excellence for Skilling, designed to equip youth with industry-relevant expertise. These centres will be set up with global partnerships to support Make for India, Make for the World manufacturing.

India's Foundational Large Language Models India is not only developing a robust AI ecosystem but has already made significant strides in creating foundational AI models. The government has ensured that India's AI advancements are indigenous. IndiaAI has launched a significant initiative to develop indigenous foundational AI models, including LLMs and SLMs, through a call for proposals.

One of the standout achievements is Digital India BHASHINI, India's AI-led language translation platform which seeks to enable easy access to the internet and digital services in Indian languages, including voice-

based access, and help the creation of content in Indianlanguages.

BharatGen the World's First Government Funded Multimodal LLM Initiative. BharatGen, is a generative AI, was launched in India in 2024, in Delhi. The initiative is designed to revolutionize public service delivery and boost citizen engagement by developing a suite of foundational models in language, speech, and computer vision. BharatGen includes a consortium of top AI researchers across premier academic institutions in India.

Sarvam-1 AI Model, this innovative large language model is optimised explicitly for Indian languages, addressing a critical gap in the AI landscape. Sarvam-1, boasting 2 billion parameters, supports ten major Indian languages, demonstrating its potential to revolutionize various applications such as language translation, text summarization, and content generation. Chitralekha is an open-source video transcreation platform developed by AI4Bh?rat. Leveraging advanced AI models, Chitralekha empowers users to generate and edit audio transcripts in various Indic languages effortlessly. The platform's open-source nature encourages community contributions and fosters innovation in AI-powered video processing. SML's Hanooman has unveiled Everest 1.0, a versatile multilingual AI system designed to cater to various Indian languages, including Hindi, Bengali, Tamil, and Telugu. The system currently supports 35 languages and is poised to expand its language capabilities to 90 shortly.

India Leads Global AI Talent and Skill Penetration AI Talent Pipeline & AI Education Beyond Metro Cities Under the IndiaAI Future Skills initiative, AI courses will be expanded across undergraduate, postgraduate, and Ph.D. programs. Additionally, fellowships are being provided to full-time Ph.D. scholars researching AI in the top 50 NIRF-ranked research institutes. To ensure inclusive access to AI education, the government is setting up Data and AI Labs in Tier 2 and Tier 3 cities. These labs will offer foundational AI courses to a broader demographic. A model IndiaAI Data Lab has already been established at the National Institute of Electronics and Information Technology (NIELIT) in Delhi.

India Ranks 1st in Global AI Skill Penetration According to the Stanford AI Index 2024, India leads globally in AI skill penetration. India ranks first globally in AI skill penetration with a score of 2.8, surpassing the US (2.2) and Germany (1.9). The country has also witnessed a remarkable 263% growth in AI talent concentration since 2016, positioning itself as a major global player in AI.

India also leads in AI Skill Penetration for Women with a penetration rate of 1.7, followed by the US (1.2) and Israel (0.9). This achievement signifies India's ongoing efforts to bridge gender disparity in AI skill development.

Growing Presence in AI Innovation When it comes to innovation and technology, Indian youth are among the best. India has emerged as the fastest-growing developer population globally, ranking second in public generative AI projects on GitHub. India is positioning itself as an innovation hub for AI, housing 16% of the world's AI talent and demonstrating rapid adoption of AI skills.

India among Top 5 Fastest-growing AI Talent Hubs The "India Skills Report 2024" by Wheebox forecasts that India's AI industry will reach USD 28.8 billion by 2025, with a CAGR of 45%. Additionally, the AI-skilled workforce in India has seen a 14-fold increase from 2016 to 2023. India stands among the top five fastest-growing AI talent hubs, alongside Singapore, Finland, Ireland, and Canada. The projected demand for AI professionals in India is anticipated to hit around 1 million by 2026.

India's GenAI ecosystem Grows Remarkably Amid Global Downturn According to a report by NASSCOM in November 2024, India's Generative AI ecosystem has grown remarkably amid a global downturn. It said that Indian GenAI startup funding, at about USD 51 million in Q2FY2025, saw over 6 times rise quarter-on-quarter, led by B2B and agentic AI startups.The evolution of the Indian GenAI ecosystem from experimental use cases to scalable, production-ready solutions is reflected in its growing maturity.

India is leading in AI Adoption According to a recent report compiled by BCG, India is leading in AI adoption, with 80% of companies identifying AI as a core strategic priority, surpassing the global average of 75%. It revealed that 69% of Indian companies plan to increase their tech investments in 2025, with one-third of these companies set to allocate over $25 million to AI initiatives. This reflects the nation's drive towards a comprehensive digital transformation agenda. According to the Randstad AI & Equity Report 2024, AI has made rapid inroads into workplaces in India, with seven in 10 employees using some form of AI at work in 2024, up from 5 in 10 a year earlier.

The Continuous Rise of Indian AI By leveraging AI-driven technologies such as autonomous agents, small and medium-sized businesses (SMBs) are unlocking efficient ways to scale, delivering personalised customer experiences and optimising back-office operations. According to a report by 'Salesforce', as many as 78% of small and SMBs in India using AI have reported revenue growth. 93% of Indian SMBs surveyed said AI has helped increase revenues.

AI Market Growth in India India's AI market is experiencing exponential growth, as highlighted by the BCG-NASSCOM Report 2024. The AI market will grow at CAGR of 25-35%, emphasizing innovation and job creation potential. While AI automates routine tasks, it generates new job opportunities in data science, machine learning, and AI-driven applications.

Growing Network of Accelerators India is home to 520+ tech incubators and accelerators. India has the third-largest number of active programs in the world, with 42% of programs set up in the past five years to support the needs of Indian startups.

Accelerators like T-Hub MATH provide AI startups with crucial guidance on product development, business strategy, and scaling. For instance, in the initial months of 2024, MATH had over 60 startups under its fold, and five of them are under discussion for funding.

Source: statetimes.in

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KEY CHANGES IN INDIA EFFECTIVE FROM JANUARY 1, 2025: WHAT YOU NEED TO KNOW

SHIVAM

As we step into the new year, a number of significant reforms and updates will take effect across various sectors in India. These changes will affect everything from personal finance and vehicle costs to pension withdrawals and digital payment systems. It's essential for both individuals.

As we just entered into the new year, several key reforms and updates across various sectors will come into effect in India. These changes will impact everything from personal finance and vehicle prices to pension withdrawals and digital payments. Individuals and businesses must stay informed and prepare for these shifts to make the most of the new opportunities and manage any challenges. Here are the top changes to note.

Breakdowns of Key Changes

1. Increased Car Prices

Impact: Major automobile manufacturers, including Maruti Suzuki, Hyundai, Mahindra, and MG, have announced price hikes ranging from 2-4% for various vehicle models.

Reason: The price increase is attributed to rising input and operational costs.

Effect: Customers planning to purchase a new vehicle in early 2025 should expect higher prices.

2. Kisan Loan Reforms By RBI

Impact: The RBI has introduced a significant reform in agricultural financing, allowing farmers to avail unsecured loans up to 2 lakh without the need for mortgage guarantees.

Reason: To support small and marginal farmers, reduce collateral and margin requirements, and alleviate the rising input costs in agriculture.

Effect: This move is expected to improve access to credit and help farmers enhance productivity.

3. UPI Payment Limit Increase

Impact: The per-transaction limit for UPI 123Pay has increased from 5,000 to 10,000, and for UPI Lite, the limit has gone up from 500 to 1,000.

Reason: The increase is designed to provide greater flexibility for underserved groups like senior citizens and rural users who rely on digital payment methods.

Effect: Users can now make higher-value transactions more easily, enhancing financial inclusion.

4. EPFO Pension Withdrawal Simplification

Impact: Starting January 1, 2025, pensioners under the Employees' Provident Fund Organisation (EPFO) can withdraw their pensions from any bank's ATM without additional verification.

Reason: The new system, part of the EPFO's IT modernization project, aims to streamline pension withdrawals and enhance accessibility for retirees.

Effect: Pensioners will benefit from greater ease in accessing their pension funds, improving convenience and reducing the bureaucratic hurdles.

5. Visa and Travel Reforms

Thailand's E-Visa System: Thailand will launch its global e-Visa system on January 1, 2025, simplifying the visa application process for international visitors. and Indian citizens can still travel visa-free for up to 60 days.

Visa Appointment Rescheduling for US: Non-immigrant visa applicants in India can now reschedule their appointments free of charge once, starting from January 1, 2025.

Effect: These changes will make travel easier for Indian citizens, particularly for those visiting Thailand and the US.

6. Fixed Deposit Changes

Impact: The RBI has updated Fixed Deposit (FD) rules for non-banking financial companies (NBFCs) and housing finance companies (HFCs), effective from January 2025.

Reason: The new rules focus on terms like accepting public deposits, maintaining minimum liquid assets, and ensuring repayment of public deposits.

Effect: These updates will enhance the security of FD investments and require adjustments by investors.

7. Sensex and Derivatives Expiry Changes

Impact: From January 1, 2025, the expiration day for Sensex and Bankex derivatives contracts will shift from Fridays to Tuesdays.

Reason: This revision aims to align with market trends and improve the trading cycle.

Effect: Traders and investors in stock market derivatives need to adjust their strategies and expectations accordingly.

8. Changes in Visa Requirements

H-1B Visa Process Overhaul: Starting January 17, 2025, the US will modernize its H-1B visa process to make it more flexible for employers and smoother for Indian F-1 visa holders.

Effect: Indian applicants seeking US work visas should prepare for a more streamlined process.

9. LPG Price Adjustments

Impact: LPG prices for both domestic and commercial cylinders are expected to be adjusted starting January 1, 2025.

Effect: Consumers should monitor price changes for potential increases, affecting household and business expenses.

Source: currentaffairs.adda247.com

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MOOD OF THE NATION: ECONOMY IS THE ONE THING MODI 3.0 HAS TO GET RIGHT

YASHWANT DESHMUKH-FOUNDER -C VOTER
SUTANU GURU - DIRECTOR-C VOTER)

Since elections are rarely one-issue referendums, the Modi regime has managed to ensure that unhappiness over economic prospects did not transform into raging anger the way it did in 2013 and 2014 for the United Progressive Alliance regime.

Sustained success has an uncanny ability to camouflage weaknesses that could turn fatal if the stars align in a malevolent manner. In India, a third consecutive mandate to the National Democratic Alliance under Narendra Modi is a classic example of sustained success. Yet, the third mandate came with a powerful caveat: the ordinary citizen was unhappy with how their family struggled to make ends meet.

Ever since the Covid-19 pandemic, the nation's mood has been consistently pessimistic about livelihood issues. Since elections are rarely one-issue referendums, the Modi regime has managed to ensure that unhappiness over economic prospects did not transform into raging anger the way it did in 2013 and 2014 for the United Progressive Alliance regime.

The exclusive Mood of The Nation Survey conducted by C-Voter for India Today indicates that the Modi regime confronts the formidable challenge of fixing the livelihood issues of ordinary Indians. Thus far, doubts, scepticism, and worries about quality of life and standard of living have not turned into anger. But who knows when that might happen if they persist?

Even a cursory look at the responses to the C-Voter survey reveals the extent of economic hardships Indian households face. When asked to highlight the biggest successes of the Modi government, a little more than 15 per cent of the respondents identified the construction of the Ram Temple and the Kashi Vishwanath Corridor, and close to 11 per cent identified corruption-free governance as the biggest success. But when asked about the biggest failures of the regime, about 21 per cent each singled out inflation and unemployment.

Recent data suggests that both inflation and unemployment have been declining. For instance, retail inflation based on the consumer price index fell to 4.3 per cent in January 2025. But stubbornly persistent inflation in food, commuting, and energy hammers the family budgets of lower-middle-class and middle-class Indians. When a housewife has to shell out Rs 65 for a litre of milk and often Rs 50 for a kilo of onion, telling her inflation is a moderate 4.3 per cent doesn't help.

When close to two-thirds of citizens say that they find it difficult to manage daily household expenses, the government is failing somewhere. You can't keep blaming supply constraints and freak weather conditions for years when food inflation remains persistently high. It is a policy and management failure.

So far, the Modi regime has been lucky that such perceptions have not turned into wrath. Other responses make it abundantly clear that this is not a temporary or transient challenge faced by the Modi regime. It has become a long-term problem.

For instance, 33 per cent said in January 2024 that their economic status had improved during the Modi regime, and more than 35 per cent said it had deteriorated. In January 2025, however, 35 per cent said it had improved while 31 per cent said it had deteriorated. That, by any yardstick, is not a ringing endorsement of the Modi regime. Perhaps Indian voters are convinced that the Opposition would perform even worse given a chance. That is the only logical explanation for the continued satisfaction with the performance of the Modi regime.

Ordinary Indians are not very optimistic even about their prospects. Many believe their family incomes will fall in a year than those who think it will rise. These are perceptions based on lived experience that drive the behaviour of citizens as consumers.

As has often been stated, unlike China, which has been largely investment-driven for decades, India is a consumption-driven economy. About 60 per cent of the GDP is accounted for by private consumption. The remarkable economic recovery in the post-Covid era has ensured that India has become the fastest-growing major economy in the world.

Car, SUV, and iPhone sales have been touching stratospheric heights year after year. But there is also a grim reality beneath the glitz. India sold 22 million two-wheelers in 2018. Despite jaw-dropping GDP growth, two-wheeler sales in 2022 barely touched 17 million units. Even in 2024, the industry has reported total sales of about 20 million units. The reason is simple: the middle-class and aspirational Indians are reluctant to spend money on things that are not deemed "essential". It is no surprise that while iPhone sales are zooming, sales of budget smartphones have stagnated for a long time.

The first Modi term was spent repairing the economy and providing basic infrastructure like toilets and electricity connections. The second time was spent on issues like Article 370, the Citizenship Amendment Act, the construction of the Ram Temple, and other "non-economic" issues. The third term needs to focus on basic economic management.

(Views expressed in this opinion piece are those of the authors)

Source: www.indiatoday.in

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THE INDIA ADVANTAGE: 6 REASONS WHY SUPPLY CHAINS ARE LEAVING CHINA

AMY WUNDERLIN

A new survey found U.S. C-Suite executives are over three times more likely to choose India over China for their future supply chain needs.

Global trade patterns have been on the move for the last five years as U.S. companies continue to focus on diversifying their supply chains. Combine steep tariffs and an unprecedented pandemic with increasing climate disasters, geopolitical tensions, and greater consumer preference for sustainable and ethical practices, and it becomes clear that supply chains must continue to evolve to mitigate these higher costs and disruptions. For many companies, this looks like moving away from a reliance on China. A recent survey by OnePoll conducted for India Index found that U.S. C-Suite executives are over three times more likely to choose India over China for their future supply chain needs. Of the 500 U.S. executives surveyed, 61% said they would consider sourcing from India if they knew India had the same materials as China.

So why India? We spoke with Samir N. Kapadia, founder and CEO of India Index, who gave us six compelling reasons companies may choose India over China for future supply chain needs.

1. Rising tariffs and costs : Tariffs placed on imports from China in 2018 have contributed significantly to a need to move American business elsewhere. With no tariff relief in sight, if you hadn't already diversified sourcing either locally or to another country, the pandemic almost made it a necessity. "In many respects, China is now in a bit of disfavor," said Kapadia, adding that it's not just about costs but concerns of forced labor, intellectual property theft, and increasing shareholder-driven campaigns to motivate companies to diversify out of China.

"If you're an importer in the United States, and you're paying a 25% tariff, now your supplier is getting accused of forced labor, there's constant risk on intellectual property theft…where do you land?" asked Kapadia.

2. Concerns over intellectual property theft : Intellectual property theft is another major concern for U.S. companies trading with China, especially fear of stolen technology. The Five Eyes intelligence-sharing network, made up of officials from the United States, Britain, Canada, Australia and New Zealand, recently accused China of stealing secrets across various sectors, including innovations from quantum technology and robotics to biotechnology and artificial intelligence. OnePoll's survey found that 54% of respondents felt that China had high risk as it relates to intellectual property, while 29% of companies thought the same of India.

3. Fear of reputational risk : While companies could once ignore a mark on their reputation due to the low cost of doing business, today's conscious consumer is holding companies accountable like never before.

"The reputation of a company can be very much hinged upon the way they conduct supply chain," said Kapadia. "The Fortune 500, even beyond, are now seeing that they need to operate within countries where they won't get slammed in some op-ed, or they won't get called up to some congressional hearing given their practices."

4. Economic growth in India : As the fastest-growing economy in the world at a rate of 7.2% GDP, India is becoming an interesting alternative for global trade. With economic growth comes greater investment in infrastructure, allowing India to also fill many of the gaps that once prevented it from competing on the world stage.

"The whole purpose of India's infrastructure growth is to provide for these companies to now come in and feel they have that support system," said Kapadia. "We think that's very much going to be the trend over the next five years, and this sort of gap that we've seen in India will slowly kind of come to a close."

5. The promise of aligned political landscapes : Political risk (53%) was the top concern amongst U.S. executives when it came to trading with China. Another 26% also felt it was 'very risky' to trade with China, compared with India at 12%.

This perceived safety in India can be attributed in part to greater political alignment between the country and the United States. Under the current administration of Prime Minister Modi, who's promoted the idea that the United States and India have never been more aligned, Kapadia said America is now taking a second look at India in a way they haven't before. "They feel like India's now matured; that they've kind of arrived on the global stage," he said.

As a result, Kapadia said he expects this year to see a domino effect across sectors as everyone from the large- to small-sized enterprises considerably shift their supply chain away from China.

6. Large corporate commitments : Leading by example is exactly what companies like Tesla, Apple and Walmart have been able to do with greater investment in India over the last few years. Walmart, for example, recently pledged to import $10 billion worth of product every year from India starting in 2027, and others are likely to follow suit.

"You're going to see that incremental shift as a few of those kind of anchor companies show the world that it can be a successful way…to do all the things that China's done well for a very long time and to bring them to India," said Kapadia.

Source: SCMR

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INFRASTRUCTURE DEVELOPMENT IN INDIA

SANTOSH KUMAR | SARLA MEENA | RISHITA AGGARWAL

Introduction : Public infrastructure is the backbone of economic development, enhancing connectivity, trade, and overall quality of life. India, the world's **fifth-largest economy**, has made remarkable progress in infrastructure development over the past decade.

The total infrastructure investment in India has significantly increased, with public and private sector contributions shaping the growth trajectory. India's total infrastructure spending has grown exponentially, with budget allocations rising to **10 lakh crore in 2023-24**.

PM Gati Shakti : The **PM Gati Shakti National Master Plan (NMP),** launched in **2021**, is designed to bring together various Ministries, including Railways and Roadways, to ensure **integrated planning** and **coordinated execution** of **infrastructure projects**. The initiative aims to provide **seamless** and **efficient connectivity** for the movement of people, goods, and services across various modes of transport, thereby enhancing last-mile connectivity and reducing travel time. This project has onboarded **44 Central Ministries** and **36 States/UTs** and a total of **1,614 data layers** have also been integrated, by October 2024. A milestone of assessing **208** big-ticket infrastructure projects worth **Rs. 15.39 lakh crores**, of various Ministries adhering to PM Gati Shakti principles has been achieved.

India's **World Bank Logistics Performance Index (LPI)** ranking improved by **6 places** from 44 in 2018 to **38** out of 139 countries in **2023**. To complement PM GatiShakti, **National Logistics Policy** was launched in **September 2022**. **26 states** have notified their State-level logistics policy, so far.

Highways and Roads : India has the **second largest road network in the world** and its National Highways span a total length of **1,46,145 km**, forming the primary arterial network of the country. The Government of India has undertaken several initiatives to enhance and strengthen the National Highways network through flagship programmes such as the **Bharatmala Pariyojana** which includes the subsumed National Highway Development Project (NHDP), the **Special Accelerated Road Development Programme** for the North-East Region (SARDP-NE), and many more ongoing projects.

- **India's National Highway (NH) network** expanded from 65,569 km in 2004 to 91,287 km in 2014 and **1,46,145 km in 2024.**
- NH stretches with **four or more lanes** grew **2.6 times** from 18,371 km in 2014 to **48,422 km** in **2024.**
- Operational **High-Speed Corridors** increased from 93 km in 2014 to **2,138 km** in **2024**.
- NH **construction pace** rose **2.8 times** from 12.1 km/day in 2014-15 to **33.8 km/day** in **2023-24**.
- **Capital expenditure** (including private investment) surged **5.7 times** from 53,000 crore in 2013-14 to **3.01 lakh crore** in **2023-24** (highest ever).

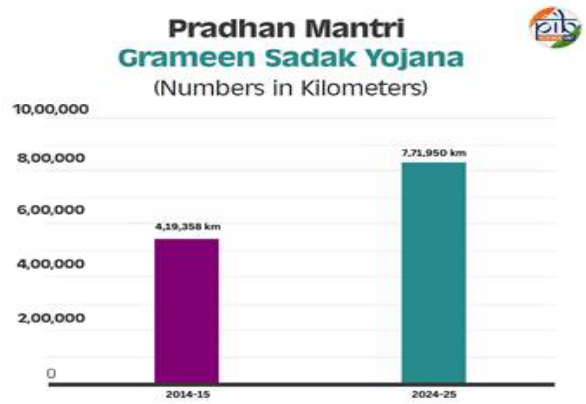
Bharatmala Pariyojana : Launched in **2017**, the Bharatmala Pariyojana envisages development of about **26,000 km** length of **Economic Corridors**, which along with Golden Quadrilateral (GQ) and North-South and East-West (NS-EW) Corridors are expected to carry majority of the freight traffic on roads. It also envisages development of ring roads / bypasses and elevated corridors to decongest the traffic passing through cities and enhance logistic efficiency. A total of **18,926 km** of roads have been completed under project by **November 2024**.

Further network of **35 Multimodal Logistics Parks** is planned to be developed as part of Bharatmala Pariyojana, with a total investment of about **Rs. 46,000 crore**, which once operational, shall be able to handle around **700 million metric tonnes** of cargo.

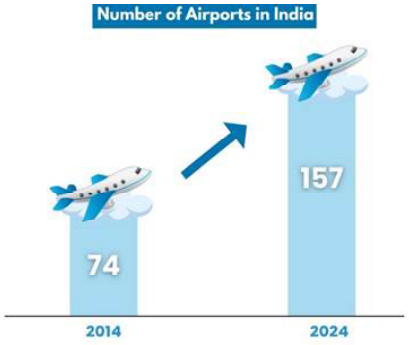
Pradhan Mantri Grameen Sadak Yojana : The Pradhan Mantri Gram Sadak Yojana (PMGSY), was launched by the Government of India, in **2000**, to provide **connectivity** to **unconnected habitations** as part of a poverty reduction strategy.

In **2006-2007**, **1,07,370 km** of roads were completed under the PMGSY, with a total expenditure of **10,769 crore.** In **2014-15**, **4,19,358 km** of roads were completed with a total expenditure of **130,149 crore** and in 2024-

25, **7,71,950 km** of roads were completed with a total expenditure of **331,584 crore.**



Civil Aviation : India's aviation sector is experiencing a meteoric rise, fueled by soaring demand and the government's unwavering commitment to its growth through supportive policies. This dynamic shift has propelled India to the forefront of the global aviation ecosystem, becoming the **third-largest domestic aviation market** in the world.



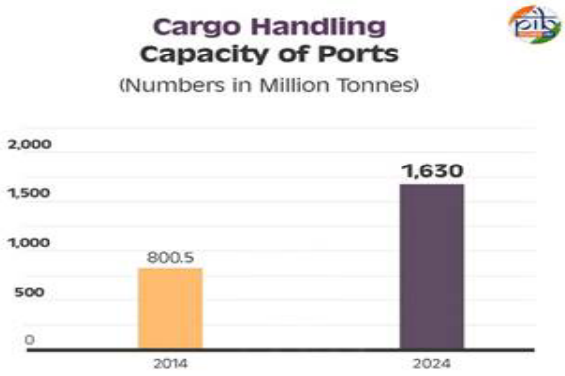
- The number of **operational airports** in India in 2014 were 74. By **September 2024**, the number had increased to **157**.
- **Over 15%** of India's **pilots** are **women**, significantly higher than the global average of 5%.
- Marking a new **record**, **domestic air passenger traffic** crossed **5 lakhs** for the **first time** in **a single day** on November 17, 2024.
- The number of **Flying training organisations (FTOs**) in June 2016 was 29. This number increased to **38** with **57 bases** by **December 2024**.
- In terms of **aircrafts**, the numbers have increased from around 400 in 2014 to **723** in **2023**, despite the impact of Covid-19.

Regional Connectivity Scheme (RCS) - UDAN (Ude Desh ka Aam Nagrik)

By reviving existing airstrips and airports, UDAN, launched in **2016**, aims to bring essential air travel access to previously **isolated communities** and **boost regional economic development**. With a **ten-year** operational plan, UDAN intends to ensure equitable access to air travel for all Indians. As of 31 Dec 2024-

- **147.53 lakh** passengers have availed of the benefits of the scheme.
- **More than 2.93 lakh flights** have operated under the UDAN scheme so far.
- **619 RCS routes** have so far commenced operations connecting **88 airports** including 13 heliports & 2 water aerodromes.

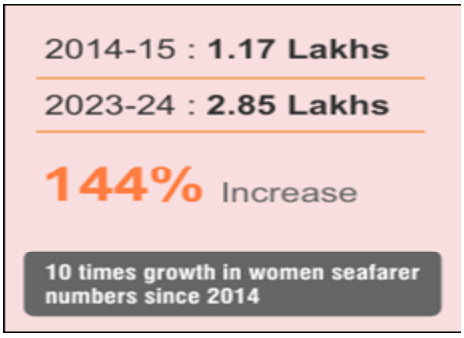
Shipping and Ports : The **Maritime Sector in India** comprises of Ports, Shipping, Shipbuilding, Ship repair and Inland Water Transport Systems. In India, there are total **12 government owned major ports** and approximately **217 minor and intermediate ports**. Indian Shipping Industry has over the years played a crucial role in the maritime sector of India's economy. Approximately **95%** of the country's trade by **volume** and **70%** by **value** is moved through Maritime Transport.



- **Cargo handling capacity** has increased from 800.5 million tonnes per annum in 2014 to **1,630 million tonnes per annum** in **2024**. Vis-à-vis 2014, this is an **87%** improvement.
- India has reached **22nd rank** in **International Shipment** category as against 44th rank in 2014.
- **Turn Around Time (TRT)** of major Ports has reduced from around 94 hours in FY-2013-14 to only around **48.06 hours in FY 2023-24**.
- The **average ship berth-day output** vis-a-vis FY 2014-15 have improved by **52%**.
- Tourist footfall in **2022-23** for **ocean cruise** has risen to **3.08 Lakhs** and for **light house** has risen to **12.3 lakhs** compared to the year 2014-15.
- Capacity at major ports stood at:

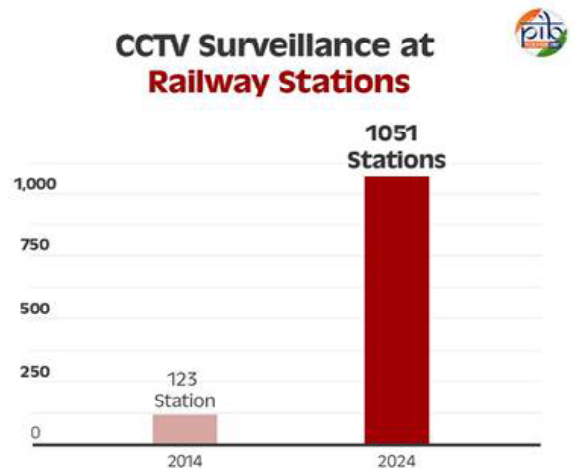
S. No.	Year	Port Capacity	Traffic Handled
1	2004-05	397.50	383.75
2	2014-15	871.52	581.34
3	2023-24	1629.86	819.23

- The **number of ships/vessels** increased from 1,250 in 2014-15 to **1,526** in **2023-24**, culminating in a **22% increase**.
- Number of **employed sea-farers** are:



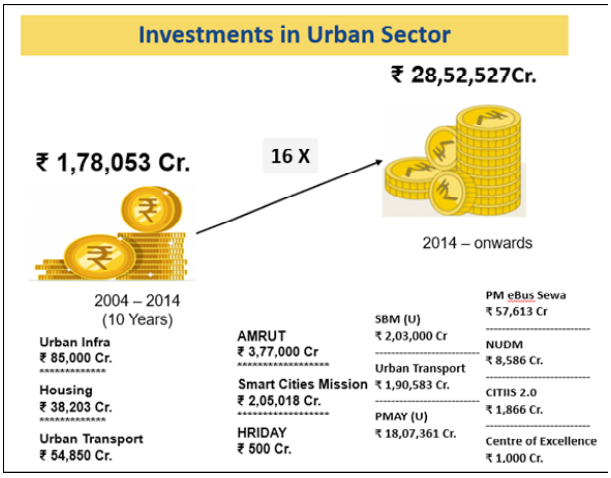
Railways : Indian Railways **achieved a historic milestone**, transporting over **3 crore** passengers in a single day on **November 4, 2024**. On this day Indian Railways carried a record number of **120.72 lakh non-suburban passengers.** This included **19.43 lakh** reserved passengers and **101.29 lakh** unreserved non-suburban passengers. Similarly, the suburban traffic reached a **record 180 lakh passengers**, making it the **highest single-day passenger figure of the year.**

- The manufacturing of Linke-Hofmann-Busch **(LHB) coaches** has increased from 2,209 coaches in year 2006-2014 to **31,956 coaches** in year **2014-2023**.
- The provision of **Bio-toilets** in coaches has been increased from 3,647 coaches in year 2006-2014 to **80,478 coaches** in year **2014-2023**.
- The Production units of Indian Railways are producing only LHB coaches from April-2018 onwards and trains operated with ICF coaches are being converted so as to run with LHB coaches.
- In 2005-06, 33,540 km and in 2014-15, 41,038 km of **running tracks** were **electrified**.
- During 2004-14, 14,985 RKM of rail track work was done whereas during **2014-23, 25,871 RKM** of track laying work has been done. In the year **2022-23**, per day **14 km** track was laid.
- Rail connectivity to **four states of Meghalaya, Arunachal Pradesh, Manipur & Mizoram** provided after 2014 (Meghalaya in November 2014, Arunachal Pradesh in February 2015, Manipur (Jiribam) in May 2016 & Mizoram (Bhairabi) in March 2016).
- Before 2014, the number of stations equipped with CCTV surveillance facilities was 123 whereas during **2014-23,** CCTVs were installed across **743** railway stations. By **December 2024**, CCTV coverage was increased to a total of **1051 stations**.



Urban Affairs and Housing

- Under the **Smart Cities Mission (SCM)**, total projects are **8,076**, amounting to **1,64,706 crore**, of which **7,401 projects** amounting to **1,54,351 crore** have been completed, as per the data provided by **100 Smart Cities**.
- Under Swachh Bharat Mission – Urban 2.0, there has been a **97% increase** in the **urban waste collection** from 2014-15 to 2024-25.
- The **waste processing percentage** has increased from 18% in 2014-15 to **78%** in **2024-25**.
- During 2004-14, 13.46 lakh houses were approved under schemes like JnNURM & RRY. This increased substantially (**9 times**) in **2015-2024**, when **118.64 lakh houses** were approved under **PMAY-U**.
- During 2004-14, 8.04 lakh houses were built and marking a **11x increase**, during **2015-24, 88.32 lakh houses** were **completed**.



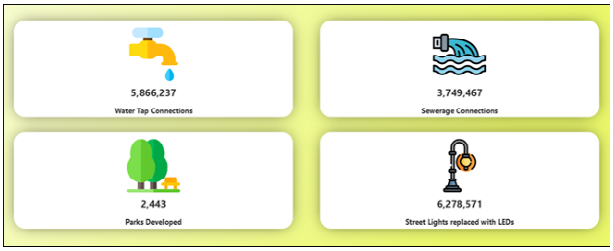
- Achievements in the field of **metro rail** in the last ten years are:

PARAMETERS	Upto 2014	2014-24
Total Operational Metro Rail Network	248 Km	993 Km
Average Metro Rail Lines Commissioned per month	0.68 Km / Month	6 Km / Month
Average Daily Ridership	28 Lakh	Over 1 Crore
Annual Budget	Rs 5798 (2013-14)	Rs 24844 (2024-25)
Total Cities with Operational Metro Rail	**5**	**23**

- The number of **buses** sanctioned from 2004-2014 were 14,405 and this increased to **19,752** during **2014-24**.

AMRUT (Atal Mission for Rejuvenation and Urban Transformation)

Launched in **2015**, AMRUT aims at ensuring every household has **access to a tap** with the assured supply of **water** and a **sewerage connection**, increasing the amenity value of cities by **developing greenery** and **well-maintained open spaces** (e.g. parks) and **reducing pollution** by switching to public transport or constructing facilities for non-motorized transport (e.g. walking and cycling). As of **February 1, 2025**, there are:



Jal Jeevan Mission

The Jal Jeevan Mission (JJM) was launched on **August 15, 2019**, with the ambitious goal of **providing tap water supply** to **every rural household**. At the time of its inception, only **3.23 crore (17%)** of rural households had tap water connections. As of February 1, 2025, the Jal Jeevan Mission (JJM) has successfully provided tap water connections to 12.20 crore additional rural households, bringing the total coverage to over **15.44 crore households**, which accounts **for 79.74%** of all rural households in India. This achievement marks a significant milestone in the mission.

Source: PIB

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HOW DID INDIA RESPOND TO GLOBAL SUPPLY CHAIN DISRUPTIONS?

AKSHAY HEGDE

The National Logistics Policy and other government initiatives promoted a seamless movement of goods and enhanced the Logistics Performance Index of the country.

Over the past decade, India developed as an influencer in the global supply chain and attracted investment from multinational corporations. With its steadfast efforts, self-reliant initiatives, and resilient economic policies, India's logistics sector anticipates growing from $200 billion in 2020 to $320 billion in 2025 at a CAGR of 10%. Though the consumer-driven and unstructured value chain suffered from lasting disruptions during the pandemic, a diverse corporate ecosystem, quick turnaround times, and technological advancement are gradually revamping the logistics framework and replenishing its former vigour. The coronavirus calamity exposed global supply chain potholes, which India leveraged as a massive opportunity to address with its resources, quality products, and competitive prices. The rise of value-added services, faster digitisation, cashless deliveries, compliant operations, and capital influx from external investors consolidated the logistics sector and propelled its growth trajectory. Moreover, the National Logistics Policy and other government initiatives promoted a seamless movement of goods and enhanced the Logistics Performance Index of the country. Post-pandemic, the following trends in the Indian supply chain continues to fill the void in global logistics and support the growth of industries like agriculture, pharmaceuticals, eCommerce, and manufacturing.

SEZ and duty-free imports : India created a parallel ecosystem for industrial success and restructured the legal framework for Special Economic Zones (SEZ) with duty-free imports. SEZ boosted IT-related operations and developed National Highway Networks, ports, and airlines as favourable investment destinations. Emerging Development Financial Institutions (DFIs) provide long-term loans to facilitate cheaper quality power, effluent treatment, skill development, and testing and certifications to meet international standards. Moreover, SEZ-produced items seek sales in the domestic market at the lowest prescribed duties to generate investment and employment opportunities within the country.

Tax exemption : The "Atmanirbhar Bharat" initiative displaced imports from foreign countries and promoted sales in the domestic and global markets simultaneously. Such self-reliant activities boosted the country's foreign exchange reserves and encouraged investment in the Domestic Tariff Area (DTA). Conversely, the government incentivised investors, production units, and developers in the SEZ with tax exemption on profits. The investor-friendly regulatory policies, competitive infrastructure for both DTA and SEZ, and zero import duty regime made India an attractive investment destination for global supply chain players.

Source: www.itln.in

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UNION MINISTER SHRI BHUPENDER YADAV INAUGURATES A DAY-LONG CONCLAVE - 'WASTE RECYCLING AND CLIMATE CHANGE 2025'

Industry-wide adoption of Circular Approaches is critical to driving Sustainable Growth and Resource Efficiency: Shri Bhupender Yadav

Four Key Strategies for a Successful Circular Economy highlighted - Redesigning Products for Circularity; Investment in Advanced Recycling Technologies; Strengthening Supply Chain Collaboration; Consumer Awareness and Behavioral Change

Union Minister for Environment, Forest and Climate Change, Shri Bhupender Yadav today inaugurated a day-long conclave organized by the Recycling and Environment Industry Association of India (REIAI), on 'Waste Recycling & Climate Change 2025'.

Addressing the inaugural session, the Union Minister stated, "India generates around 62 million tonnes of waste annually, with plastic, electronic, and hazardous waste growing rapidly. The traditional linear economic model of take, make, and dispose is no longer sustainable. The increasing pressure on landfills, depletion of natural resources, and environmental damage from unchecked waste disposal require urgent action. The circular economy is not just an alternative; it is essential. It marks a fundamental shift in how we produce, consume, and manage materials". A well-functioning circular economy not only conserves natural resources but also fosters industrial innovation, economic competitiveness, and job creation, he stated.

Shri Yadav said that under the visionary leadership of Prime Minister Shri Narendra Modi, India is shifting from waste management to harnessing the economic potential of recycling through waste to wealth initiative. "The circular economy has a major role in the future including reducing, reusing, and recycling at every stage, from product design to end-of-life management. Waste should not be treated as a burden but as a resource. Adopting sustainable practices is crucial for achieving economic resilience, environmental sustainability, and social security", he added.

The Minister further stated that by the year 2050 India's circular economy is expected to have a market value of $2 trillion and create 10 million jobs. It a big opportunity for start-ups and new recycled product developers. It is important to align this growth with environmental sustainability, drawing inspiration from nature's efficient recycling systems as nobody recycles like Nature, he added.

Shri Yadav urged the recycling industry in the country to develop and adopt newer innovative technologies for reducing dependence on natural resources as well as cutting down imports of critical minerals needed for economic growth. "Adopting circular economy principles can bring tremendous economic benefits. This shift towards resource efficiency aligns seamlessly with our national vision of Atmanirbhar Bharat, enhancing the competitiveness of Indian industries in global markets", the Minister added.

The Minister informed that the Ministry has been instrumental in formulating policies and regulations,

including Extended Producer Responsibility (EPR) frameworks, that incentivize recyclers and integrate the informal sector into formal recycling systems. These initiatives aim to streamline waste management and promote eco-friendly production across industries. The Ministry has notified a number of market-based Extended Producer Responsibility (EPR) Regulations, including those on e-waste, end-of-life vehicles, plastic packaging, waste tyres, waste batteries, used oil. The revenue earned by registered recyclers from sale of EPR certificates is additional profit earned over and above the profit generated from the sale of recycled product, he added.

Shri Yadav said that the government has laid down the policies but Industry-wide adoption of circular approaches is critical to driving sustainable growth and resource efficiency. The Minister highlighted 4 key strategies in this direction:

1. **Redesigning Products for Circularity:** Companies must move beyond single-use models and design products for recyclability. The integration of biodegradable, reusable, and modular components will help extend product life cycles and reduce waste.
2. **Investment in Advanced Recycling Technologies:** Adoption of emerging technologies can transform waste management systems, thereby improving recovery rates.
3. **Strengthening Supply Chain Collaboration:** Businesses need to collaborate across the value chain to optimize resource utilization, create closed-loop production systems, and build markets for secondary raw materials.
4. **Consumer Awareness and Behavioural Change:** Circularity requires active consumer participation. Industries must invest in campaigns to engage consumers, incentivize recycling, and promote sustainable consumption behaviours.

Dr Amandeep Garg, Additional Secretary, Ministry of Environment, Forest and Climate Change and Chairman, Central Pollution Control Board (CPCB) said, "There is a huge gap and huge potential to work towards waste recycling system, as the role of recycling industry is important cut imports of various critical products needed for economic growth". Corporate houses should lead the transition to a circular economy by incorporating recyclable designs, promoting sustainability in dealership operations, and enhancing consumer awareness, he added.

The event witnessed the presence of Dr. Ashok Kumar, President, Recycling and Environment Industry Association of India and subject experts from the industry and about 200 delegates environmental scientists, waste management professionals and policymakers.

Source: Ministry of Environment, Forest and Climate Change
PIB

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GLOBAL SUPPLY CHAIN SHIFT: HAS INDIA FINALLY ARRIVED?

RAVI JAKHAR, CHIEF STRATEGY OFFICER, ALLCARGO GROUP., ET CONTRIBUTORS

Synopsis : Global supply lines are shifting for more resilience. Geopolitical developments put India at an advantage. Will demographic dividend finally create value for India?

The first half of this decade has been a nightmare for global trade. From covid disruptions to Suez Canal and Red Sea crisis, the trade has witnessed many operating challenges. The economic environment puts further stress on demand and as an outcome, global trade is expected to grow between 2020-25, at only half the average growth rate of previous decade. However, amidst this challenging environment, India has found its glory moment. The fastest growing economy in the world and now a favoured destination for new manufacturing investments, India has got everything right to launch the economic miracle, much like Japan did in 1950s and China in 1980s.

India has an opportunity at hand, that can propel the country to become the second largest economy in the world by 2075 on the back of sustained growth spanning decades. Japanese miracle lasted for over twenty years with Japan growing at nearly 10% during the golden age of capitalism from 1950 to 1973. Subsequently, from 1979 to 2010, China witnessed three decades of growth averaging similar 10%. Both stories had three things in common. First, a favourable geopolitical environment. China entered age of reform and people growing up in 1980s were considering western economies as friends, much different from an anti-capitalism view prevailing earlier.

Japan was witnessing unprecedented support from US, which provided aid and opened markets for Japanese exports, which further increased during the Korean War. The second aspect was government policies. Liberal reforms of China supporting manufacturing growth and the Japanese government were key drivers of development. Third and equally important was demographic advantage. The availability of labour in

China and suitable demographics in Japan enabled economic miracles. Now, as we look at India, all these three factors align well.

We are a friendly country which is being preferred for supply chain diversification and government is launching much needed reforms to drive manufacturing led growth amidst favourable geopolitical environment. With age and skill on our side, it truly is a perfect moment to reap demographic dividend and aim for $35 trillion economy in 2047. Unprecedented third consecutive term for Prime Minister Modi or Modi 3.0 is well positioned for taking economic reforms to the next level.

There are many concurrent events shaping the Indian opportunity. As per a media report, in 2023, Morgan Stanley analysts noted increased labour costs, geopolitical tensions, and human rights concerns prompting businesses to decrease reliance on China as the world's factory. According to Kearney's Reshoring Index, Chinese goods constituted 50.7% of US imports of manufactured goods from Asian countries in 2022, down from nearly 70% in 2013. Additionally, Japan, South Korea, and Europe are seeking new supply lines in the Asia-Pacific, providing another opportunity for India's growth in global trade in the coming decades.

Moreover, as businesses increasingly adopt novel technologies such as Gen AI for smart **logistics** and optimise supply chain processes, India's leading position in 'AI talent concentration' on the Network Readiness Index 2022 signifies the nation's preparedness for this transformative journey.

Furthermore, India's climate commitments, including achieving net-zero emissions by 2070, adds to its appeal for countries seeking environmentally sustainable trade practices. The country benefits from a young workforce, technological expertise, a strong climate stance, strategic political alliances, government initiatives for logistics advancement, and a home market with a burgeoning demand.

Furthermore, besides engineering a diplomatic triumph for the Global South in the G20 summit last year, India strategically positioned itself in something equally momentous on the sidelines: the India-Middle East-Europe Economic Corridor (IMEEC). Once completed, the IMEEC, a cross-border ship-to- rail network, could enhance trade speed between India and Europe by 40%, establishing India as a pragmatic and agile global ally. From far east to west and south, India has everyone's attention and capital is gradually flowing in to drive manufacturing growth. However, a few risks remain and the country must address them on topmost priority.

As JP Morgan's Dimon said, trade openness, less protectionism, regulatory transparency, and consistency in taxation will encourage companies to invest in India. Also, there is an urgent need to revive special economic zones which are not stifled by legacy compliances. Together with industrial parks and export-focused hubs, such dedicated spaces will accelerate growth, according to Kearney's definitive 2021 white paper, 'Shifting Global Value Chains: The India Opportunity', prepared for the World Economic Forum. Further, India already has unique port side ancillary infrastructure in Container Freight Stations and right policy and initiative can help leverage them to drive India's emergence as trading and distribution hub.

Logistics is the backbone of economy and it has to be efficient to make manufacturing led growth possible. The government does recognise that and hence structural transformations are being brought about by the National Logistics Policy, Sagarmala Project and the PM Gati Shakti initiative. Technology enabled logistics framework, and integrated transport modes and utilities, will bring down logistics costs. At policy level, we have all the underpinnings for a world-class supply chain. The progress is already visible as India has moved up by six places in the World Bank's Logistic Performance Index for 2023.

However, a lot more needs to be done. A lot of Indian manufacturing is in the hinterlands and there is a need to set up dedicated export oriented manufacturing cities near the coastline and as much to enhance the rail connectivity of ports and manufacturing clusters. The plan for dedicated freight corridors (DFCs) is the perfect answer, however, the slow implementation poses a big risk to our development ambitions. The western DFC launched in 2006 is yet to connect JNPT to the north and we must ensure that new corridors don't take that long from ideation to execution.

India has the DNA of services economy, driven by the growth in IT and other services in the last three decades. It would be ideal to leverage that capability by promoting logistics service providers to focus on delivering most efficient services, while Government can facilitate by providing requisite infrastructure. Much like Europe, US and later Japan and China, India's domestic distribution is dominated by home grown companies and they are all capable of shifting to multi-modal logistics on the back of robust infrastructure. The strong focus on technology places them well to enable partnership with manufacturers to build best in class supply chains.

India is already an exporter to reckon with in iron and steel, heavy metals, specialty chemicals, agricultural goods, active pharmaceutical ingredients, generic drugs, electronics, and vaccines. The central government's initiatives like Make in India and the export-led scheme of production-linked incentives (PLI) are gradually propelling other industries too. Backed by its Foreign Trade Policy, the government aims to increase India's overall exports to USD 2 trillion by 2030. If we can continue to improve on the ease of doing business, there is no limit to the opportunity at hand. The government must bring in more clarity in interpreting land and labour laws, nurture a culture of R&D, and improve urban standards of living for expats.

With its strong macroeconomic advantages, India stands to harness significant supply chain opportunities in this multipolar world and thus fully capitalise on the ongoing global trade restructuring. India's moment has indeed truly arrived and we must seize it with manufacturing empowered by efficient logistics.

(Disclaimer: The opinions expressed in this column are that of the writer. The facts and opinions expressed here do not reflect the views of www.economictimes.com.)

Source: Economic Times

BUDGET 2025: SUPPLY CHAIN MANAGEMENT

Supply Chain Management: Definition : Supply chain management coordinates sourcing, production, and logistics to ensure efficient delivery of products and services to customers. It involves managing the flow of goods, information, and money from raw materials to delivery, focusing on inventory control, demand forecasting, supplier relationships, logistics optimization, and risk reduction. The primary goals are to streamline processes, reduce costs, enhance customer satisfaction, and improve competitiveness, requiring collaboration among suppliers, manufacturers, distributors, and retailers.

Supply Chain Management: Key Takeaways :

1. IMPORTANCE OF COLLABORATION: Effective collaboration among supply chain partners is crucial for the success of the entire supply chain. Transparency, communication, and cooperation are key to ensuring smooth operations.

2. TECHNOLOGY INTEGRATION: Leveraging technologies such as AI, IoT, blockchain, and data analytics can optimize supply chain processes, enhance visibility, and improve decision-making.

3. RISK MANAGEMENT: Proactively identifying and addressing risks in the supply chain, such as disruptions, delays, or quality issues, is essential to maintain continuity and resilience.

4. SUSTAINABILITY PRACTICES: Implementing sustainable practices in the supply chain, such as reducing waste, carbon footprint, and promoting ethical sourcing, not only benefits the environment but also enhances brand reputation.

5. LEAN PRINCIPLES: Adopting lean principles, such as just-in-time inventory management and continuous improvement, can help streamline operations, reduce costs, and increase efficiency.

6. DEMAND FORECASTING: Accurate demand forecasting plays a critical role in optimizing inventory levels, minimizing stockouts, and improving customer satisfaction.

7. SUPPLIER RELATIONSHIP MANAGEMENT: Cultivating strong relationships with suppliers and vendors is fundamental to ensuring reliability, quality, and cost-effectiveness in the supply chain.

8. CONTINUOUS IMPROVEMENT: Embracing a culture of continuous improvement through feedback loops, performance monitoring, and regular reviews can drive efficiency and innovation in the supply chain.

9. AGILE FLEXIBILITY: Being agile and adaptable to changing market conditions, customer demands, and unforeseen challenges is essential to thrive in today's dynamic business environment.

10. CUSTOMER-CENTRIC APPROACH: Putting the customer at the center of supply chain management decisions can lead to higher customer satisfaction, loyalty, and competitive advantage.

Supply Chain Management Involves...

PLANNING: This step involves predicting demand, organizing production timelines, and controlling inventory to make sure the right products are available when needed. Companies must anticipate future requirements based on market trends and customer preferences.

SOURCING: Successful sourcing means building strong connections with suppliers. This includes negotiating contracts, managing supplier interactions, ensuring timely delivery of quality materials, and being adaptable to unexpected situations.

MANUFACTURING: This part focuses on turning raw materials into finished goods through processes like assembly, testing, inspection, and packaging. Efficient manufacturing aims to reduce waste and make the best use of resources.

DELIVERY: After products are made, they need to be delivered to customers efficiently. This includes managing logistics, distribution centers, warehousing, order fulfillment, and transportation systems to ensure timely arrival.

RETURNS HANDLING: Also known as reverse logistics, this stage deals with the return of defective or excess products through the supply chain. It involves managing returns effectively while keeping customer satisfaction high.

Importance of Supply Chain Management : Good supply chain management (SCM) can save a lot of

money by removing unnecessary steps in production and lowering excess inventory. It is also vital for managing risks, helping companies prepare for unexpected issues like natural disasters or supplier problems. Additionally, effective SCM can avoid expensive product recalls and improve a company's reputation by maintaining high-quality standards throughout the supply chain.

In short, SCM is a collaborative approach that involves working together with different people inside the company and with outside partners like suppliers and distributors. By prioritizing efficiency, cutting costs, and ensuring customer satisfaction, companies can use SCM as a key strategy for long-term success in their markets.

Types of Supply Chain Models : Supply chain management varies for each company. Every business has unique goals, limitations, and strengths that influence its SCM approach. Here are some models a company can use to direct its SCM activities:

CONTINUOUS FLOW MODEL

This model involves a manufacturer consistently producing the same product, anticipating steady customer demand. It is a traditional supply chain approach, often suitable for established industries.

AGILE MODEL

The agile model focuses on adaptability, allowing a company to respond to specific needs as they arise. This approach is ideal for businesses facing unpredictable demand or those offering custom products.

FAST MODEL

This model highlights the rapid turnover of products with short life cycles. Companies using a fast chain model aim to quickly take advantage of trends, produce goods swiftly, and sell them before the trend fades.

FLEXIBLE MODEL

The flexible model is ideal for businesses impacted by seasonal changes. Some companies experience high demand during peak seasons and lower demand at other times. This model allows for easy adjustments in production levels.

EFFICIENT MODEL

In industries with narrow profit margins, companies may seek to enhance their supply chain efficiency. This could involve optimizing equipment use, managing inventory better, and streamlining order processing.

CUSTOM MODEL

If the above models do not meet a company's needs, a custom model can be developed. This is often essential for specialized industries with specific technical demands, such as automobile manufacturing.

How Supply Chain Management (SCM) Functions

SCM is a continuous effort by businesses to improve the efficiency and cost-effectiveness of their supply chains.

Generally, SCM focuses on coordinating the production, shipping, and distribution of products. By managing the supply chain effectively, companies can reduce unnecessary costs and streamline processes, allowing them to deliver products to customers more quickly. This involves better control over internal inventories, production, distribution, sales, and the inventories of suppliers. SCM is founded on the principle that most products available in the market result from the collaboration of various organizations within a supply chain. While supply chains have been around for a long time, many companies have only recently recognized their importance in adding value to their operations.

Ethics & Supply Chain Management

Ethics plays a vital role in supply chain management, giving rise to a framework known as supply chain ethics. Nowadays, investors are keen to understand how businesses create their products, care for their employees, and safeguard the environment. In response, companies are implementing strategies to minimize waste, enhance working conditions, and reduce their environmental footprint, all of which relate to supply chain management.

Key Differences Between Supply Management and Supply Chain Management

Although these terms are often used interchangeably, they have different meanings:

SCOPE: Supply management mainly deals with buying goods and services for a company, while supply chain management includes a broader range of activities like logistics, production planning, inventory management, and distribution.

OBJECTIVE: The primary aim of supply

management is to purchase goods at the best price to meet the company's needs; supply chain management focuses on improving overall efficiency in delivering products and services through teamwork among various organizations.

COLLABORATION LEVEL: Supply management usually involves limited contact with outside parties; supply chain management requires significant cooperation among different organizations involved in the product's journey.

Both supply management and supply chain management are crucial for a company's success, but they have different roles in managing resources effectively.

Supply chain management in India: Some Case Studies

1. FLIPKART:Flipkart, a major e-commerce platform in India, has created a highly effective supply chain system that uses modern technology and data analysis. The company has advanced order management systems to ensure fast and reliable delivery of products across the country. This method not only boosts operational performance but also enhances customer satisfaction by reducing delivery times.

2. DABUR:Dabur, a top consumer goods company, has a strong supply chain management strategy to manage the flow of its wide range of products from production to consumers. By closely tracking the production and distribution processes, Dabur makes sure its products are available in the market, which helps to minimize stockouts and improve overall efficiency.

3. RELIANCE RETAIL: Reliance Retail, part of Reliance Industries Ltd., runs one of the largest retail networks in India. The company uses centralized supply chain management to optimize inventory levels, streamline product sourcing, and improve distribution methods. This approach allows Reliance Retail to keep costs down while enhancing its operational effectiveness across its vast network of stores.

4. AMUL: Amul is famous for its unique supply chain model called the "Amul Model." This model connects farmers directly to the supply chain, ensuring they receive fair prices for their milk while also meeting consumer demand for fresh dairy products. Amul's successful SCM practices have been crucial to its growth and serve as a standard for other companies in the dairy industry.

5.ASIAN PAINTS: Asian Paints is India's leading paint company, known for its robust supply chain that thrived during challenges like the COVID-19 pandemic. It sells directly to about 75,000 small hardware stores, bypassing large distributors. The company employs effective demand forecasting through Sales & Operations Planning (S&OP) to ensure product availability during peak festival seasons.

EXAMPLE OF SUPPLY CHAIN MANAGEMENT (SCM) FAILURE

Supply chain management can fail for many reasons, such as inadequate planning, absence of backup plans, and dependence on unproven suppliers. A well-known case is the KFC chicken shortage in the UK in 2018.

INCIDENT OVERVIEW

In February 2018, KFC UK changed its food distribution supplier from Bidvest to DHL. This move aimed to enhance operations and boost efficiency. However, several key mistakes led to a major breakdown in their supply chain.

Key Factors Leading to Failure

1. **SINGLE DISTRIBUTION CENTER:**DHL relied on one distribution center in Rugby for all UK KFC locations, making the system vulnerable to disruptions.
2. **TRAFFIC INCIDENT:**A serious accident on the M6 blocked access to the distribution center on DHL's takeover day, halting deliveries.
3. **LACK OF CONTINGENCY PLANNING:**KFC had no backup suppliers or centers, leaving them unprepared for DHL's logistical issues.
4. **INEXPERIENCE WITH CHILLED FOODS:**DHL's lack of experience in handling chilled food led to delivery failures and operational challenges.
5. **OPERATIONAL IMPACT:**Over 700 KFC locations temporarily closed due to chicken shortages, with only 266 of 870 restaurants open by February 18th.
6. **PUBLIC RELATIONS FALLOUT:**Negative media coverage damaged KFC's reputation, frustrating customers with closed stores and missing items.
7. **RESPONSE MEASURES:**KFC issued public apologies via social media and newspapers, acknowledging mistakes and outlining corrective actions.

Source: economictimes.indiatimes.com

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ROLE OF GEM IN EMPOWERING MSMES

MRS. KSHEMLATA, MBA & DR. NRIPENDRA KUMAR, AGM/BHEL JAGDISHPUR

Introduction : Micro, Small, and Medium Enterprises (MSMEs) are the backbone of the Indian economy, contributing significantly to GDP, exports, and employment. According to the Ministry of Micro, Small and Medium Enterprises, the sector consists of around 63.4 million units and employs around 111 million people. However, MSMEs face various challenges such as limited access to markets, finance, technology, and skilled labor, which hamper their growth and competitiveness. The government has taken several initiatives to support and empower MSMEs, and one such initiative is the Government e-Marketplace (GeM). GeM is an online platform for procurement of goods and services by the government departments, organizations, and public sector undertakings (PSUs). In this article, we will discuss the role of GeM in empowering MSMEs in India.

Background of GeM : Government e Marketplace (GeM), facilitates online procurement of common use Goods & Services required by various Government Departments / Organisations / PSUs. GeM aims to enhance transparency, efficiency and speed in public procurement. It provides the tools of e-bidding, reverse e-auction and demand aggregation to facilitate the government users, achieve the best value for their money.

The purchases through GeM by Government users have been authorised and made mandatory by Ministry of Finance by adding a new Rule No. 149 in the General Financial Rules, 2017.

GeM was launched by the government in August 2016, with the objective of making the procurement process transparent, efficient, and cost-effective. The platform provides a single window for online procurement of goods and services, with minimal human intervention, and maximum transparency. It is a one-stop-shop for all government procurement needs, and any registered buyer can purchase goods and services from registered sellers on GeM. The platform also provides various value-added services such as product catalogs, bid submission, and payment integration.

Role of GeM in Empowering MSMEs : The Micro, Small and Medium Enterprises are engine of inclusive growth and a very important sector of Indian economy. The MSME Sector has emerged as a vibrant and dynamic sector producing a vast range of products starting from basic Agro products to high precision engineering tools and equipment (Usharani & Gopinath, 2020). M. Alaguraja and G. Nedumaran (2020) mentions that one of the major issues affecting the performance of sector is Lack of Distribution of Marketing Channels. MSME's not adopting innovative ideas for promotion of the products distribution and advertisements. Because of ineffective advertisement and poor marketing channels leads to a very poor selling. GeM provides the opportunity to MSMEs to showcase their products and also visibility of all requirements of government entities. As per detail available on GeM site on 12th Mar'23, 67,357 Nos buyer organizations and 5,995,932 Nos Sellers are registered on GeM Portal. Out of that, 856,401 Nos registered ellers and service providers are MSMEs. It is noteworthy to mention that order value processed on portal is 368390 Cr till 12th Mar'23 and out of that 52.50% order was placed on MSMEs by government entities. As noted earlier, to give equal opportunity to all the MSMEs, it is now mandatory for the entire government department to procure through the GeM portal only under rule 149 in the general financial rule 2017. Because of this, now the small-scale industries are able to get government orders. Access to information has also become easier and conducting business smoothly with the government has enhanced significantly with the use of GeM portal.

According to the researchers, GeM is providing equal and balanced opportunities to all the MSMEs to place bids and generate orders. Apart from that, it will also create transparency in transactions.

The GeM portal has been helpful in giving a competitive space to small players in a wide marketplace among large players. SMEs need a sustained cash flow to thrive in their business. By inclusion of government entities in their customer base, it fortifies their cash inflows as it ensures regular order book from the government given, they have large requirements with nil probability of bad debts along with timely payments to MSME.

The benefits to the seller as mentioned on GeM website are:

- Provide transparency and ease of buying
- Offers rich listing of products for individual category of goods/services
- Direct purchase for amounts upto INR 25000
- L1 purchase for amounts greater than INR 25000 and less than INR 5 Lakhs
- Proprietary Article Certificate Bid- Procurement of specific product as per requirement
- Price Trends and Price Comparison from Multiple Suppliers
- Direct notifications to sellers
- Integrated Payment System
- Easy to comprehend interface to search, compare, select and buy
- User friendly dashboard for monitoring supplies and payments

- Online grievance redressal mechanism for quick resolution
- Direct purchase, L1, Push button procurement,
- Bid/RA mode of procurement and forward auction for auction.
- GeM has enriched listing of approximately 10000 products categories and 290 services categories wherein millions of sellers have offered their catalogue.
- Buyers can now select bid duration between 3 & 45 days.
- Delivery period upto 365 days and upto 6 years with approval.
- Option to provide multiple consignee locations and quantity
- Multiple consignee can be selected for Services
- Pin-code based seller selection for Direct Purchase Mode
- ATC library available for addition of terms and conditions
- Additional Deductions can be applied by buyers at the time of bill generation
- Notification to buyers regarding:
- expiry of DP (Delivery Period) for the contract
- Initiation of cancellation of contract in case of non-delivery by sellers
- Buyer during technical evaluation can make a MSE seller eligible or ineligible for MSE purchase preference.
- Now buyers get the option to cancel the Product contract(s) even if the invoice has been generated by seller provided 15 days have expired from delivery period.
- 18 Banks have enabled GeM Pool Account

GeM has emerged as a game-changer for MSMEs in India, as it has provided them with a level playing field to compete with larger enterprises for government procurement contracts. Here are some of the ways in which GeM is empowering MSMEs:

Access to Government Procurement Contracts : One of the biggest challenges for MSMEs is to access government procurement contracts, as they often lack the resources and infrastructure to bid for large contracts. GeM has simplified the procurement process and made it more accessible for MSMEs. Any MSME with a valid GSTIN can register as a seller on GeM and offer their products and services to government buyers. This has opened up a vast market for MSMEs, which was previously inaccessible due to bureaucratic hurdles and lack of transparency.

Equal Opportunity to Compete : GeM provides MSMEs with an equal opportunity to compete with larger enterprises for government contracts, as the platform is based on a transparent, competitive, and rule-based bidding process. GeM follows a dynamic pricing model, where the prices of goods and services are determined by market forces, rather than fixed by the government. This provides a level playing field for MSMEs, as they can compete with larger enterprises based on their quality, price, and delivery capabilities, rather than their size.

Transparent and Efficient Procurement : GeM has brought transparency and efficiency to the government procurement process, which was previously plagued by corruption, delays, and inefficiencies. The platform provides real-time information on procurement, from tender creation to award of contract, and payment to the seller. This has reduced the time and cost of procurement, and also improved the quality of goods and services procured by the government. MSMEs benefit from the transparent and efficient procurement process, as they can focus on delivering quality products and services, rather than navigating bureaucratic hurdles.

Access to Finance : MSMEs often face challenges in accessing finance, as they lack collateral and credit history. GeM has tied up with various banks and non-banking financial companies (NBFCs) to provide working capital finance to MSMEs registered on the platform. This has enabled MSMEs to access finance at competitive rates, without the need for collateral. The platform also provides a rating system for sellers, based on their performance and quality of products and services. This rating system helps MSME

GeM portal is still evolving and upgrading continuously. Government is extremely aware of the sector's potential for growth, especially with a platform like GeM at its disposal. It is for the benefit of MSMEs and SMEs that services like GeM Sahay provide access to credit swiftly at the time of order acceptance itself.

The GeM Portal is empowering MSMEs by providing opportunity to sell to stakeholders (All Government entities) they otherwise wouldn't access while also receiving assistance in terms of technology, marketing, and finance with services like GeM Sahay. Several researchers believe that GeM will increase employment opportunities, business growth and will provide the equal opportunity to MSMEs in conducting business in ever evolving digital world.

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DESIGN THINKING AND ITS APPLICATION IN SUPPLY CHAIN MANAGEMENT

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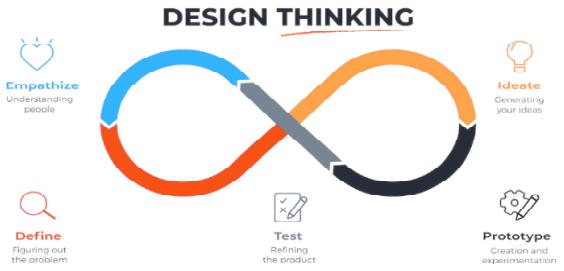
Introduction: Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success[1]. Design thinking can be applied to supply chain management to create innovative solutions that meet the needs of customers, suppliers, and other stakeholders. A design thinking diagram for supply chain management can show the different stages of the design thinking process and how they relate to the supply chain activities of plan, make, and deliver.

The diagram illustrates how the design thinking process can be aligned with the supply chain activities as follows:



Source: https://www.maqe.com/insight/the-design-thinking-process-how-does-it-work/

Creating Value (Design Thinking) + Capturing Value (Efficiency Methodologies) = Competitive Advantage

- **Empathize**: This stage involves understanding the needs, pain points, and expectations of the users and stakeholders of the supply chain. This can include conducting interviews, surveys, observations, and other research methods to gain insights into their problems and goals.
- **Define**: This stage involves synthesizing the findings from the empathize stage and defining the problem statement and the scope of the solution. This can include creating personas, journey maps, value propositions, and other tools to articulate the user needs and desired outcomes.
- **Ideate**: This stage involves generating possible solutions that address the problem statement and meet the user needs. This can include brainstorming, sketching, prototyping, and testing different ideas and concepts that can improve the supply chain performance and efficiency.
- **Plan**: This stage involves selecting the most promising solution from the ideate stage and planning how to implement it in the supply chain. This can include defining the objectives, metrics, resources, timeline, and risks of the solution and how it will affect the supply chain activities of plan, make, and deliver.
- **Make**: This stage involves executing the plan and developing the solution in the supply chain. This can include designing, building, testing, and deploying the solution and ensuring its quality, functionality, and compatibility with the existing systems and processes.
- **Deliver**: This stage involves delivering the solution to the users and stakeholders of the supply chain and measuring its impact and value. This can include collecting feedback, monitoring performance, evaluating outcomes, and identifying areas for improvement or iteration.

Design thinking can be applied to supply chain problems to create innovative solutions that meet the needs of customers, suppliers, and other stakeholders. Some examples of design thinking in supply chain use cases are:

- **AI and machine learning for autonomous supply chain planning**: Consumer packaged goods (CPG) companies can use AI and machine learning to integrate the entire end-to-end supply chain and run the majority of processes and decisions through real-time, autonomous planning. This can help them respond to changing demand patterns, optimize inventory levels, reduce costs, and increase revenue[2].
- **Design for supply chain principles**: Design for supply chain is a part of the design for excellence (DFX) philosophy that focuses on creating designs that improve a certain aspect of a product. For example, design for manufacturing (DFM) aims to reduce manufacturing costs and complexity, design for assembly (DFA) aims to simplify product assembly and reduce assembly time, design for sustainability (DFS) aims to minimize environmental impact and waste[3]. These principles can help supply chain managers improve product quality, efficiency, and customer satisfaction.

- **Blockchain for supply chain transparency and traceability**: Blockchain is a distributed ledger technology that enables secure and transparent transactions among multiple parties. Blockchain can be used in supply chains to track the origin, movement, and status of products and materials across different stages and locations. This can help improve visibility, accountability, security, and trust among supply chain partners. Blockchain can also enable smart contracts that automate transactions and enforce agreements based on predefined rules[4]. Some industries that are developing blockchain use cases in their supply chains are agriculture, food supply, maritime logistics, pharmaceuticals, luxury goods, and fashion[4].

Design thinking can be applied to various areas within the supply chain to drive innovation, improve efficiency, and enhance customer satisfaction. Here are some specific applications of design thinking in different supply chain areas:

1. **Demand Forecasting and Planning**: Design thinking can help improve demand forecasting and planning processes. By empathizing with customers and understanding their buying behaviour, logistics companies can design data-driven forecasting models that take into account market trends, customer preferences, and other relevant factors. This approach can lead to more accurate demand forecasts, reducing inventory costs and minimizing stockouts or excess inventory.
2. **Supplier Relationship Management**: Design thinking can be applied to enhance supplier relationship management. By empathizing with suppliers and understanding their pain points and requirements, companies can design collaborative and transparent processes that foster better communication, trust, and long-term partnerships. This can lead to improved supplier performance, reduced lead times, and better supply chain resilience.
3. **Inventory Management:** Design thinking can help optimize inventory management processes. By empathizing with inventory managers and understanding their challenges, companies can design inventory systems that provide real-time visibility, automated replenishment mechanisms, and efficient stock allocation strategies. This approach can lead to lower carrying costs, reduced stockouts, and improved order fulfilment.
4. **Transportation and Logistics Optimization**: Design thinking can be applied to optimize transportation and logistics operations. By empathizing with drivers, logistics personnel, and customers, companies can identify pain points and design solutions that streamline route planning, enhance load optimization, and improve delivery tracking and communication. This can result in reduced transportation costs, faster order fulfilment, and enhanced customer experience.
5. **Sustainable Supply Chain Practices:** Design thinking can help integrate sustainability into supply chain practices. By empathizing with stakeholders and understanding environmental and social impact concerns, companies can design sustainable strategies and solutions. This can include optimizing packaging to reduce waste, implementing green transportation initiatives, and collaborating with suppliers to ensure responsible sourcing practices. Design thinking enables the exploration of innovative and eco-friendly approaches that align with sustainability goals.
6. **Supply Chain Risk Management**: Design thinking can be utilized to improve supply chain risk management. By empathizing with risk managers and understanding potential disruptions, companies can design robust risk assessment frameworks, contingency plans, and mitigation strategies. This approach helps in identifying vulnerabilities, designing resilient supply chain networks, and implementing proactive measures to mitigate risks.
7. **Continuous Improvement and Innovation**: Design thinking can foster a culture of continuous improvement and innovation within the supply chain. By encouraging collaboration and creativity among employees, companies can design processes that support idea generation, prototyping, and experimentation. This approach enables a proactive approach to problem-solving, encourages innovative thinking, and drives ongoing improvement across the supply chain.

Applying design thinking in supply chain areas enables companies to gain a deeper understanding of the needs and pain points of stakeholders involved, leading to more effective and customer-centric solutions. By focusing on empathy, collaboration, and creativity, organizations can drive positive change and achieve competitive advantages in the dynamic supply chain landscape.

Case Study: Optimizing Last-Mile Delivery for an E-commerce Company

Challenge: An e-commerce company is facing challenges in its last-mile delivery operations, resulting in customer dissatisfaction, high delivery costs, and inefficient routes. The company wants to improve its last-mile delivery process to enhance customer experience and operational efficiency.

Design Thinking Approach:

1. **Empathize**: The company conducts interviews and surveys with customers, delivery drivers, and customer service representatives to understand pain points and gather insights. They identify issues

such as missed deliveries, long wait times, and lack of real-time communication.

2. **Define**: Based on the insights gathered, the company defines the problem as the need to optimize last-mile delivery to reduce delivery times, increase delivery success rates, and enhance customer communication.

3. **Ideate**: The company conducts brainstorming sessions with cross-functional teams, including logistics managers, drivers, customer service representatives, and IT experts. They generate ideas such as leveraging route optimization software, implementing real-time tracking and notifications, and introducing flexible delivery options.

4. **Prototype:** The company develops a prototype solution that integrates a route optimization algorithm into their delivery management system. The system enables real-time tracking and notifications for customers, and offers delivery flexibility through features like rescheduling and alternative pickup points.

5. **Test**: The company selects a pilot location or a specific customer segment to test the prototype solution. They monitor delivery times, success rates, and customer feedback. Feedback from customers, drivers, and other stakeholders is collected to refine the solution.

6. **Implement**: After incorporating the feedback, the company implements the optimized last-mile delivery solution across its operations. They provide training to drivers and customer service representatives on using the new system effectively.

7. **Evaluate**: The company continuously monitors key performance indicators, such as on-time delivery, delivery success rates, customer satisfaction scores, and cost savings. They gather feedback from customers and internal stakeholders to make further improvements and iterations.

Results and Benefits: By applying design thinking to optimize last-mile delivery, the e-commerce company achieves the following benefits:

- **Improved customer satisfaction**: Customers experience faster, more reliable deliveries and receive real-time notifications about their shipments, reducing frustration and enhancing the overall shopping experience.
- **Increased operational efficiency**: The route optimization algorithm helps reduce delivery times, minimize fuel consumption, and optimize driver workloads. This leads to cost savings and improved resource utilization.
- **Enhanced communication and flexibility**: Real-time tracking and notifications enable customers to stay informed about their deliveries, enhancing transparency and reducing customer inquiries. The introduction of flexible delivery options, such as rescheduling and alternative pickup points, improves convenience and reduces delivery attempts.
- **Continuous improvement**: By collecting feedback and monitoring key metrics, the company can further refine its last-mile delivery process, address emerging challenges, and explore additional opportunities for innovation.

Through the design thinking approach, the e-commerce company successfully transformed its last-mile delivery operations, resulting in improved customer satisfaction, optimized processes, and cost savings.

Case Study: Optimizing Last-Mile Delivery for an E-commerce Company

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Design Thinking Approach:

1. **Empathize**: The company conducts interviews and surveys with customers, delivery drivers, and customer service representatives to understand pain points and gather insights. They identify issues such as missed deliveries, long wait times, and lack of real-time communication.

2. **Define**: Based on the insights gathered, the company defines the problem as the need to optimize last-mile delivery to reduce delivery times, increase delivery success rates, and enhance customer communication.

3. **Ideate**: The company conducts brainstorming sessions with cross-functional teams, including logistics managers, drivers, customer service representatives, and IT experts. They generate ideas such as leveraging route optimization software, implementing real-time tracking and notifications, and introducing flexible delivery options.

4. **Prototype:** The company develops a prototype solution that integrates a route optimization algorithm into their delivery management system. The system enables real-time tracking and notifications for customers, and offers delivery flexibility through features like rescheduling and alternative pickup points.

5. **Test**: The company selects a pilot location or a specific customer segment to test the prototype solution. They monitor delivery times, success rates, and customer feedback. Feedback from customers, drivers, and other stakeholders is collected to refine the solution.

6. **Implement**: After incorporating the feedback, the company implements the optimized last-mile delivery solution across its operations. They provide training to drivers and customer service representatives on using the new system effectively.

7. **Evaluate**: The company continuously monitors key performance indicators, such as on-time delivery, delivery success rates, customer satisfaction scores, and cost savings. They gather feedback from customers and internal stakeholders to make further improvements and iterations.

Results and Benefits: By applying design thinking to optimize last-mile delivery, the e-commerce company achieves the following benefits:

- **Improved customer satisfaction**: Customers experience faster, more reliable deliveries and receive real-time notifications about their shipments, reducing frustration and enhancing the overall shopping experience.
- **Increased operational efficiency**: The route optimization algorithm helps reduce delivery times, minimize fuel consumption, and optimize driver workloads. This leads to cost savings and improved resource utilization.
- **Enhanced communication and flexibility**: Real-time tracking and notifications enable customers to stay informed about their deliveries, enhancing transparency and reducing customer inquiries. The introduction of flexible delivery options, such as rescheduling and alternative pickup points, improves convenience and reduces delivery attempts.
- **Continuous improvement**: By collecting feedback and monitoring key metrics, the company can further refine its last-mile delivery process, address emerging challenges, and explore additional opportunities for innovation.

Through the design thinking approach, the e-commerce company successfully transformed its last-mile delivery operations, resulting in improved customer satisfaction, optimized processes, and cost savings.

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EVOLUTION OF SUPPLY CHAIN MANAGEMENT IN INDIA

ANNAPOORNA - ASSISTANT MANAGER - CONTENT

Over the last few decades, Indian supply chain management has grown significantly. With technological advancements and regulatory reforms, India is now a global hub for supply chains. In this article, we will briefly outline how the **SCM in India** has changed over the years and what it holds going forward.

Evolution of Supply Chain Management in India : The evolution began with traditional methods of merchandising, which included the use of horses, carts and boats to carry goods from one place to another. The industrial revolution in the 18th and 19th centuries had a major impact on **India's supply chain**. It enabled more efficient movement and storage of goods through the introduction of steam engines, railways, etc. In present times, supply chain management is even more essential due to the globalisation of supply chains and e-commerce boom. Thus, there is a need for improvement and efficiency in managing supply chains that are cost-effective for timely delivery.

Supply Chain Management History Timeline : To help you fully understand the evolution of supply chain management, below is a timeline of its evolution:

- **Before 1900:** Prior to the industrial revolution in the 18th and 19th century, simple tools such as hand trucks were used for loading and unloading process. Also, global shipping was more cumbersome and difficult.
- **1900s-1960s:** The focus on supply chain

management between 1900s and 1960s was on optimising internal processes. This entailed production as well as inventory management. Similarly, businesses preferred minimising costs while maximising efficiency during this time.

- **1960s-1980s:** This phase prioritised expanding the transportation infrastructure like air travel and highways. The focus was also on growing the global trade, which required new strategies for managing the inventory and the logistics.
- **1980s-2000s:** During this period, technologies like electronic data interchange {EDI), barcode scanners and enterprise resource planning (ERP) systems emerged. Among all the technologies, the introduction of ERP systems proved to be a significant turning point in the evolution of supply chain management in India. This enabled businesses to integrate all their process, including the supply chain management, into a unified platform. Also, tracking shipments, managing inventory, and coordinating with the manufacturers and suppliers was made easy.
- **2000s-2010s:** New markets emerged in this period and the global trade saw a massive growth. It created new opportunities for businesses to source raw materials and sell goods. However, this made the supply chain management more complex. It required businesses to manage their logistics across multiple regions and countries. Also, with the emergence of internet, e-commerce and online marketplaces became more prevalent. New supply chain models, such as direct-to-consumer and drop shipping, were developed. These models relied on analytics and real-time data for managing the logistics and inventory.
- **2010s-Present:** In the present day, the main focus of supply chain management is on sustainability. Now, there is more attention of minimising the carbon emission and favouring labour practices which are ethical. Businesses are also prioritizing waste reduction and the digitisation of the supply chain. This digital transformation allows for more effective management of data flows and ensures high reliability of information.

Future of Supply Chain Management : India's supply chain management is set to transform significantly through digitisation, with emerging trends like AI, machine learning, IoT, and blockchain playing key roles. These technologies enhance demand forecasting, order management, and inventory control by analysing data quickly and accurately. IoT devices provide real-time tracking, while blockchain ensures transparency and traceability, fostering a data-driven and collaborative ecosystem. Despite challenges such as ethical sourcing concerns and risk management issues, these digital advancements promise greater efficiency, optimisation, and profitability. Embracing these technologies is crucial for Indian supply chain managers to stay competitive and resilient in a global economy.

Supply chain management solutions

Several supply chain management solutions can be implemented to improve its efficiency. The key solutions include:

- **Real-Time Visibility and Risk Management:** This helps in tracking supply chain activities and enables businesses to prevent losses and ensure customer satisfaction.
- **Circular Supply Chain and Reverse Logistics:** This promotes sustainability and helps to increase profits by managing the entire lifecycle of products.
- **Cloud-Based Software:** When the data is stored in the cloud, it can help businesses to manage their inventory and streamline their supply chains.
- **Artificial Intelligence (AI):** This solution can help fix the inefficiencies, leading to cost savings and ultimately better decision-making.
- **Internet of Things (IoT) Devices:** To better control the inventory and warehouses, IoT becomes a must. It makes the supply chain more efficient and flexible.

Conclusion : To sum up, the evolution of supply chain management has been a roller coaster. It has gone from horse-drawn carts to state-of-the-art technologies such as artificial intelligence, blockchain, and autonomous vehicles. For companies to remain competitive, they must embrace cutting-edge supply chain management solutions and adopt sustainable practices.

Source: cleartax.in

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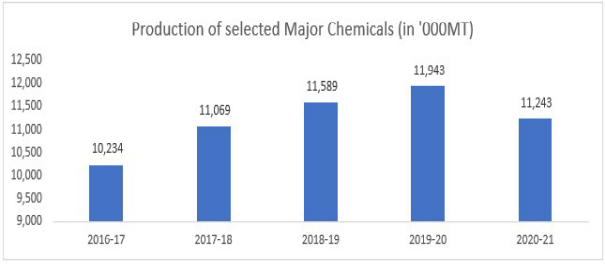
GROWING PROSPECTS OF INDIA'S CHEMICAL INDUSTRY

Chemical industry in India : The chemical industry is both a knowledge- and capital-intensive sector. It is an integral component of the Indian economy and growing at sustained pace. Petrochemicals, fertilisers, paints, varnishes, gases, soaps, perfumes, toiletries and pharmaceuticals are included in the category of basic chemicals and their by-products. The chemical sector has numerous categories, encompassing more than 80,000 commercial items. The industry plays a crucial role in providing for basic requirements and raising the quality of life in India. The sector is the backbone of the country's industrial and agricultural development. It serves as the foundation for several downstream industries, including textile, paper, paint varnish, soap, detergent and pharmaceuticals.

The Central Statistics Office's National Accounts Statistics 2021 states that the gross value added (GVA) for all economic activities in the chemical and chemical product sectors was 1.21% through 2019-20 as against 1.14% through 2018-19 at constant prices. This sector's contribution to the manufacturing sector's GVA increased from 6.25% through 2018-19 to 7.08% through 2019-20.

Total production of major chemicals have increased to 11,243 MT in 2020–2021 from 10,234 in 2016-17. Alkali chemicals made up around 69% of all production of major chemicals in 2020-21. The Indian chemical industry was estimated to be worth around US$ 178 billion in FY20 and is anticipated to reach US$ 300 billion in FY25.



Source: Department of Chemicals and Petrochemicals Annual Report

Government's initiative to promote chemical industry

To boost the growth of the chemical industry in India, the Government of India (GoI) has implemented the following schemes/policies.

Petroleum, Chemicals and Petrochemical Investment Regions (PCPIRs) : The Indian government has envisioned the PCPIRs as clusters that offer investors a transparent and investment-friendly policy and facility framework. PCPIRs have a first-rate infrastructure and provide a competitive environment favourable to business establishments. Each PCPIR covers a carefully defined area of around 250 sq. km. Along with supporting logistics and other services, these regions will have manufacturing facilities. In total, four PCPIRs have been established by the Ministry of Chemicals and Petrochemicals in Vishakhapatnam-Kakinada, Andhra Pradesh; Dahej, Gujarat; Cuddalore and Nagapattinam, Tamil Nadu; and Paradeep, Odisha. The estimated investment required to realise PCPIRs fully is Rs. 7.63 lakh crore (US$ 93.3 billion).

Chemicals Promotion and Development Scheme
To support the growth and development of the chemical and petrochemical industries, the Chemicals Promotion and Development Scheme (CPDS) was launched to create knowledge products through studies, surveys, data banks, promotional materials, etc., and disseminate the knowledge through holding seminars, conferences, exhibitions and other events. In addition, the programme rewards exceptional work in the fields of chemicals and petrochemicals to encourage research and innovation.

Production Linked Incentive (PLI) Scheme
The National Programme on Advanced Chemistry Cell (ACC) Battery Storage Production Linked Incentive (PLI) Scheme with a budgetary outlay of Rs. 18,100 crores (US$ 2.2 billion) were approved by the GoI to improve India's manufacturing capabilities by achieving a manufacturing capacity

of 50 Giga Watt Hours (GWh) of ACC. The central government is focusing on improving domestic value addition under this plan while ensuring that India's levelized battery production cost is competitive globally. The scheme envisions an investment that will increase domestic manufacturing, facilitate the creation of demand for stationary storage and battery storage for both electric vehicles and stationary storage, develop a fully domestic supply chain and attract foreign direct investments to the country.

Recent developments to boost the future of the chemical industry in India

- Indian Potash Limited (IPL) and Israel Chemicals Limited (ICL) inked a memorandum of understanding (MOU) to deliver muriate of potash (MOP) from 2022 to 2027. The deal will help increase agricultural production and enhance the lives of farmers in India.
- IFFCO began producing nano-urea and working on nano-DAP to increase the efficiency of nutrient utilisation while using less nano-urea than current levels in fertilisers.
- By utilising "Green Hydrogen," the GoI hopes to fulfil the vision of Atmanirbhar Bharat by locally producing urea and DAP.
- The Department of Chemicals and Fertilizers established a Joint Task Force to investigate ways to use petroleum and petrochemical industry waste products to manufacture vital intermediates for pharmaceutical and agrochemical industries.
- To increase the supply of DAP and NPK fertilisers for the country's farmers, Madras Fertilizers Limited signed an MoU to purchase 30,000 MT of phosphoric acid solution from M/s Agrifields, Dubai, on an annual basis for the next three years.

Exports of the chemical industry
Indian chemical exports increased by 106% from 2013–14 to 2021–22. Chemical exports from India reached a new high of US$ 29.3 billion in 2021–22, compared with US$ 14.2 billion in 2013–14. The increase in shipments of organic, inorganic, agrochemical, dyes and dye intermediates and speciality chemicals have contributed to the expansion of chemical exports. With a "Make in India" philosophy, the Indian chemical sector is now a key competitor on the international stage and generates foreign exchange for the country. As a chemical producer, India ranks third in Asia and sixth globally. Moreover, India is ranked 14th in the world for chemical exports. The country currently leads the world in dye production, with export of dyestuffs ranging from 16% to 18% in 2021-22. India exports dyes to more than 90 countries. Furthermore, India produces more than 50% of pesticides of the technical grade and is the fourth-largest producer of agrochemicals worldwide. Agrochemical exports from India to the rest of the world are close to 50%. India produces and exports the most castor oil in the world, accounting for 85-90% of all exports in this industry worldwide. India sells castor oil to more than 175 nations, with the US, China and new markets, including Turkey, Russia and Northeast Asian countries, ranking as its top export destinations.

Conclusion With the support of the Indian government, the chemical industry in India witnessed significant growth. The industry has been modernising over time through the development of novel molecules, technological advancements, improvement in product quality and launch of new product profiles to become a contemporary world-class chemical industry prepared to face international competition. Even at a time of increased global unpredictability, the sector remains a desirable centre for prospects. Global dynamics that are affecting the chemical industry would present lucrative opportunities for the Indian chemical sector in the near future. The strategic choice to prioritise and realise this value-creation potential would determine the direction of India's chemical sector and its trade performance in the future.

Selected major Chemicals: Alkali Chemicals, Inorganic Chemicals, Organic Chemicals, Pesticides & Insecticides, Dyes & Pigments

Source: www.ibef.org

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THE PERFECT ORDER

NORMAN KATZ
- PRESIDENT OF KATZSCAN INC

Introduction : Laying the foundation to building the Perfect Order

Ever since my introduction to supply chain vendor compliance in 1993, retailers, organizations and associations, advisory firms, transportation and logistics companies, and hardware and software resellers, have—from their different supply chain participation perspectives—talked about it and outlined points about what they believe comprises it. But, they have never really provided a unified, end-to-end and industry-agreed-upon definition of it. The Perfect Order has only ever been this vague concept to achieve without there ever having been a clear framework or distinct guidance on how to get there.

Akin to the Loch Ness Monster (first reported sighting on May 2, 1933) or Bigfoot, or UFOs, The Perfect Order is seemingly something that various people or entities keep pointing to on occasion but providing scant solid substantiation of. (For my part, I'm more of a believer in legendary monsters and outer-space aliens than the veracity or credibility of ambiguous business models.) And while everyone's opinions matter, what does the collective cognizance agree on in the definition of The Perfect Order?

So, in essence, we know what we want the strategic objective to be for The Perfect Order. Piecing together the tactical goals to accomplish that purpose has been pretty much left to the designs of the vendor consumer goods companies. We can look at different best practice perspectives gleaned from seminars, but what we don't have is a structured end-to-end approach to follow. This makes it a challenge to be successful. If an industry wants its members to achieve, I think that it behooves them, or rather, it is a responsibility, to create a workable model or framework that can be used as a guide for success.

In February 2005, I read an article in Logistics Today magazine, now known as Material Handling & Logistics. The article—"The Customer's Bill of Rights"—was written by Dr. Edward J. Marien, who was at the time a professor at the University of Wisconsin in Madison. I was absolutely in admiration by what Dr. Marien had so clearly outlined, because what he described was—to me—not just what a customer should be deserving of for every order, but what I truly believed was the definition of a perfect order, regardless of who the customer is, regardless of what the customer ordered, regardless of the situation.

In summary, what Dr. Marien outlined was that logistics professionals should be tasked with the following requirements in the delivery (fulfillment) of orders/shipments to ensure that these 8 Rs (Rights) of logistics performance were met to the highlight levels.

1. The Right Product
2. In the Right Quantity
3. From the Right Source
4. To the Right Destination
5. In the Right Condition
6. At the Right Time
7. With the Right Documentation
8. At the Right Cost

As Dr. Marien pointed out, the 8 Rights apply to downstream supply chains for companies interacting with their suppliers in the acquisition of goods to be used, and to upstream supply chains for companies interacting with their customers in the distribution of goods to be sold.

Having read the article—and I still retain the original magazine hardcopy—I was awestruck, as if Nessie popped her head out of the water and nodded and winked at me herself. I was convinced that Dr. Marien had outlined not just the eight rights of logistics performance, but the operational framework for the execution of The Perfect Order.

I am not suggesting that companies dismantle their traditional corporate department structure, but I am suggesting that for CPG (consumer packaged goods) and other (e.g., durable, accessory, apparel/footwear) consumer product companies, perhaps an introspective perspective is in order. After all, what is the true purpose of your company? To deliver desirable goods to the marketplace, ideally, without error each, and every, time. Aligning your company's organization to a single theme, a mantra, or a mission such as The Perfect Order makes sense to me. And here, finally, we have a realistic definition of what The Perfect Order is, albeit

with some details to fill in.

(I cited Dr. Marien's article and his Customer's Bill of Rights outline in both of my first two books, the first from a fraud prevention perspective and the second as a framework for what every retail vendor company should be striving to achieve. The link to his original article, https://www.mhlnews.com/global-supply-chain/article/22046067/the-customers-bill-of-rights, has been updated since my books were published.)

In using Dr. Marien's 8 Rights of logistics performance as a framework for The Perfect Order, we need to dig deeper—and from a current perspective—into what each of these "rights" mean. I did that in a 2018 presentation on understanding customer supply chain demands where I used Dr. Marien's Customer's Bill of Rights to explain to a business conference audience how to up their execution in a commoditized world.

(I attempted to reach out to Dr. Marien a few years ago at his last-known place of employment but to no results. I don't believe that a good use of the internet is for stalking, so I left it at that.)

Dr. Marien's 8Rs were—based on the opening line of his article—tailored to logistics and transportation professionals. In my article series here, we have to go beyond Dr. Marien's audience scope and consider everyone and every step involved in all phases of the supply chain, such as product development, planning, fulfillment, data management, software, operations. We have to consider inception to disposition, start to finish, order to delivery and then some. Both the retailer and the vendor (whether you are a name-brand or a private-labeler) have roles to play in achieving The Perfect Order for the consumer.

I'm going to use my unique supply chain and vendor compliance perspectives, and technical and operational experiences, to explore each of Dr. Marien's eight rights with you, bringing them all together into a single framework that defines what I truly believe is the long-sought-after enterprise-wide Perfect Order. In each independent article, I'll include Dr. Marien's description of the "customer right" and then delve into what I believe are the nuances that need to be considered. At the end, ideally this is a business model that retail vendors can work on applying to their companies. But retailers, there are also lessons to be learned here and applied for you, because you are the leaders who are directing your vendors, so take note. It is, after all, about getting goods into the hands of the consumer, perfectly, and that's something that vendors and retailers can both agree is a shared and common commitment for each and every order.

Source: SCMR

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MSMES AND THEIR USAGE OF E-COMMERCE FOR OPERATIONAL EFFICIENCY

SONARIKA MAHAJAN, FOUNDER, HUMANITIVE

The Micro, Small, and Medium Enterprises (MSMEs) sector contributes significantly to India's GDP and employs millions of people nationwide. The Covid pandemic caused MSMEs to see the value of digitizing and to step up their efforts to do so. Despite this, MSMEs are not entirely content because it is still unclear why digitalization has become so important to the future. E-commerce buying has grown from a necessity during the shutdown in India two years ago to popular practice. And this trend is here to stay!

Challenges Faced By The Industry : MSMEs nowadays face a variety of difficulties that keep the industry from reaching its full potential. These difficulties include a lack of trained labor, outdated technology, poor market access, difficulty obtaining raw materials, excessive financing costs, supply chain bottlenecks, a low level of consumer spending desire, and many others. Beyond this, the start of the pandemic has also harmed the industry.

While the government has been striving to revive the industry, MSMEs must embrace digital solutions to overcome some of these obstacles and hasten the pandemic's recovery. To improve operational efficiency and hasten their growth, small firms must turn to digital solutions like e-commerce and e-procurement. MSMEs may benefit from e-commerce by embracing it. These benefits include greater revenues and margins, expanded market reach, access to new markets, reduced marketing expenses, easier client

acquisition, and improved customer experiences.

How Can E-commerce Help The Industry : MSMEs are converting to digital ways to sell online as a result of the difficulties posed by traditional techniques. And during the previous five years, overall sales have increased dramatically. E-commerce is a route that allows the smallest MSMEs to increase their client base to a global level without expanding geographically, and it may help MSMEs achieve economic stability, growth, and security.

Online sales by the MSMEs evaluated by ICRIER, a government-based research body, will represent 27 percent of all sales in 2020–21. This percentage has climbed from 19 percent in 2019–20 and 12 percent in 2018–19. The increase in digital commerce can be ascribed to internet shoppers' altered purchasing patterns during the pandemic. Additionally, the government has actively pursued legislation in recent years to assist MSMEs in going digital.

India's e-commerce industry has seen significant growth as a result of the country's widespread use of cell phones, the internet, and online experiences. Customers' realization that online shopping is the safest way to acquire anything delivered right to their door has fueled the sector's expansion even further. To support this expansion, it's also necessary to comprehend the specific e-procurement needs of MSMEs and provide easy access to the market. Creating a commercial store with thousands of items from top categories including business laptops, networking equipment, industrial adhesives, tools and equipment, and safety and security across top brands is one such efficient approach.

There is also a chance to start programs like 'Bill to Ship to' to address MSMEs' other industrial demands. Company PAN. It is now easier to do business thanks to features like multi-user accounts, approvals, expenditure analytics, secure and dependable delivery, etc. that let customers claim GST credit on their billing address. In addition to removing geographical obstacles and offering a sizable client base, large-scale e-commerce firms are empowering small businesses by giving them the chance to interact directly with producers and suppliers, which lowers the cost of procurement. The small company owners are greatly assisted in scaling up their operations at a far lower level of investment because of the greater access to suppliers, which also helps to raise their cost structure.

MSMEs currently account for the second-largest source of employment in India. Additionally, there are more options now that e-commerce has become more widespread. E-commerce has increased MSMEs' total employment rates in India.

Online B2B Marketplace : In recent years, MSMEs' e-procurement demands have increased. In order to serve as a one-stop shop for small company owners, online B2B wholesale marketplaces must offer GST-enabled, technology-led solutions for all types of enterprises in India's most distant pin codes at wholesale costs. These platforms must not only offer direct access to the supplier but also access to value-added services that will help businesses cut down on paperwork, increase compliance with procurement requirements, and decrease mistakes.

Players are now more needed than ever to deliver greater insights and forecast whether or not various suppliers' items will meet a buyer's wants. Organizations need to take advantage of the chance to assist B2B companies in meeting the needs of thousands of business clients in order to increase their income.

What Does The Future Hold?

For most MSMEs in India, e-commerce has been an opportunity rather than a hindrance. And in the upcoming years, this tendency is predicted to accelerate. How can you follow the trend, and what will you need to expand, are the main questions. The best method to stand out from the competition and keep consumers is to have an online store. By creating a strong brand for themselves, key companies need to differentiate themselves from the growing number of emergent e-commerce enterprises.

In India, the MSME sector has the potential to develop more quickly because of e-commerce's ability to cut costs and provide businesses unprecedented access to a global market. MSMEs may harness the enormous power of the internet and realize its full potential thanks to government efforts like Skill India, Digital India, and Startup India, as well as private initiatives like MSME Accelerate.

Source: www.indianretailer.com

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WTO UPDATE

TRADE FACILITATION AGREEMENT: EIGHT YEARS OF CUTTING TRADE COSTS AND BOOSTING GROWTH FOR ALL MEMBERS

DDG ANGELA ELLARD

The WTO Trade Facilitation Agreement (TFA) has been a game-changer for international trade. As the first major multilateral trade agreement added to the WTO rulebook since the Uruguay Round in 1995, it has already boosted trade by more US$ 230 billion across the globe. Since taking effect in 2017, the TFA has simplified customs procedures, cut through red tape and increased regulatory transparency — making cross-border trade faster, cheaper and more predictable for businesses of all sizes.

The benefits of trade facilitation are broadly enjoyed across the full WTO membership, creating more opportunities for resilient, secure and efficient trade and supply chains for developed and developing members alike.

Streamlining trade : Trade inefficiencies are not just an inconvenience: they impose substantial economic costs. Delays in transit can account for up to 44 per cent of transport costs, resulting from storage charges, bottlenecks at weighbridges, police checks and border crossings. Every hold-up chips away at competitiveness and increases costs. This can cost businesses valuable contracts and revenue.

A single trade transaction on average involves as many as 36 original documents and 240 copies. This administrative burden not only increases costs but also discourages micro, small and medium-sized enterprises (MSMEs) from participating in global trade.

- Since its entry into force, the TFA has expedited the movement, release and clearance of goods and enhanced the transparency of trade regulations and procedures. It has also reduced excessive paperwork, unnecessary delays and inefficiencies at borders, and has fostered cooperation between customs authorities and other stakeholders.
- TFA implementation has cut trade costs worldwide by an average of 1 to 4 per cent, leading to an increase in trade of over US$ 230 billion, with the most significant gains observed in agriculture. Developing and least-developed country (LDC) members have gained the most, demonstrating the Agreement's capacity to foster **efficient trade systems worldwide and creating opportunities for more people to benefit.**

Many WTO members have reported that TFA-driven targeted reforms have led to notable reductions in the time and costs involved in border crossings, demonstrating the tangible impact of trade facilitation measures.

For example, Montenegro has increased express shipments released within one hour of arrival from 25 to 53 per cent, while Indonesia has reduced import licence processing time by an average of four days. Ecuador has cut processing times by 67 per cent annually, while Brazil has cut export costs by an ad valorem equivalent of 9 per cent and import costs by 7 per cent. Jordan has slashed processing time by as much as 75 per cent, saving US$ 15 per unit.

Infrastructure improvements stimulated by the TFA have also played a crucial role in enhancing efficiency. One-stop border posts have significantly reduced waiting times at borders, cutting customs processing time and queuing delays by 62 per cent at the Kenya-Uganda border and by 87 per cent at the Kenya-Tanzania border, creating more incentives for intra-African trade as well as African trade with the rest of the world. These examples illustrate how targeted reforms, digitalization and improved border coordination are helping WTO members streamline trade processes and unlock economic benefits.

TFA implementation is well underway but technical assistance is needed to ensure its full benefits

When implementing the TFA, developing and LDC members can categorize their commitments, giving them flexibility in putting the Agreement's provisions into practice. Category A commitments must be implemented immediately, whereas commitments under categories B and C can be implemented later. Category C allows members capacity-building support

to undertake the commitment. To clarify their commitments, members underwent a notification process, which has concluded. The focus now is on-the-ground implementation.

Figure 1: Number of Category B measures due to be implemented yearly

As implementation progresses, sustained support will be essential to ensure that all members can fully reap the benefits of the TFA. Full implementation of the Agreement promises to deliver significant gains in trade efficiency and cost reduction, but only if there is ongoing investment in developing expertise, infrastructure and regulatory reforms. The 2025 peak in Category C commitments demonstrates the urgent need for targeted interventions to address persistent structural and financial barriers.

The WTO's Trade Facilitation Agreement Facility (TFAF) plays a key role in helping developing and LDC members mobilize the technical assistance and capacity-building support they need to implement the TFA. Since its establishment, the TFAF has been instrumental in supporting developing and LDC members through their ratification of the Agreement and their submission of more than 130 notifications within agreed deadlines.

It has also assisted 46 developing members, including 18 LDCs, in securing assistance from development partners — either by sharing information or by providing project preparation grants. Thanks to TFAF support, ten developing members, including two LDCs, have successfully partnered with donors to meet their TFA capacity-building needs.

With more than 500 commitments still due for implementation over the next five years, the TFAF remains a critical mechanism for channelling resources and ensuring that technical assistance aligns with members' evolving needs.

How improvements in trade facilitation efforts can be leveraged

Digitalization offers ways to further enhance efficiency, transparency and coordination at borders. While approaches to using digital trade facilitation differ, members are discussing its role in shaping the future of trade procedures.

In 2024, members decided to use the WTO Committee on Trade Facilitation to share experiences on the impact of digitalization on TFA implementation. Discussions have highlighted both successes and challenges, with some members showcasing innovative digital solutions, and others emphasizing the need for capacity-building to bridge the digital divide across economies with different levels of development. Digitalization will continue to be on the Committee's agenda throughout 2025.

At the domestic level, national trade facilitation committees (NTFCs) provide a critical institutional framework to drive effective implementation of the TFA. These committees coordinate efforts among government agencies, often in collaboration with private sector stakeholders, to ensure a holistic approach to trade facilitation reforms. NTFCs are key to identifying implementation bottlenecks, streamlining regulatory processes and aligning technical assistance with national priorities. As members navigate the complex reforms required for full TFA implementation, NTFCs will be instrumental in ensuring that trade facilitation improvements translate into tangible economic benefits.

Value of full TFA implementation for all members

Eight years after its entry into force, the TFA continues to reduce trade costs, improve customs efficiency and expand market opportunities for all members. As full implementation progresses, the benefits for businesses and economies will accelerate.

While the benefits of trade facilitation are often highlighted in the context of developing and LDC members, the advantages extend across the entire WTO membership, including developed members. As more WTO members implement the TFA, businesses in developed members also benefit from smoother, more predictable trade flows, less red tape and fewer costly delays at borders.

Lower trade costs and greater efficiency enhance global supply chain resilience, minimizing disruptions and ensuring more secure and reliable access to products. Ultimately, continued implementation of the TFA strengthens global trade networks, making trade more inclusive, efficient and resilient to external shocks.

With sustained engagement from WTO members and development partners, trade facilitation will be a key driver of global trade efficiency and economic growth for years to come.

Source: WTO Website

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KOLKATA BRANCH

Annual Picnic 2025 : Like previous years, IIMM, Kolkata organized its Annual Picnic and get-together on Sunday, 9th February, 2025 at Happy Times, Fultala, Baruipur, South 24 Parganas in the outskirts of Kolkata. Nearly 91 members including students, faculty and staff along with their family took part in the event. We arranged two bus from Esplanade for this program. The programme began in the morning by 10 am with a session of self-introduction by the students, faculty and members followed by a variety of party games i.e. hit the wicket, pick up the coin, passing the ball, handi banga etc. The interesting game 'Tambola Housie' was the last event enjoyed by all the participants. Breakfast, lunch, tea, cold drinks along with some lip-smacking snacks were served during this day-long event. All the members have requested us to organize such a wonderful Picnic in the next year also.

ALWAR BRANCH

IIMM Alwar branch organised an evening program to celebrate the successfully Hosting of Natcom 24 during November 15-16 ,2024."The members of the Alwar branch falistated the Mr" Lalit Raj Meena and Mrs. Meena for their contribution for Natcom."About 35 Members attended the program .Mr. Rajesh Luthra welcomed the National President . Mr. Luthra briefed the branch members about the Technical sessions and excellent Hospitality provided by the branch to delegates and NC members " Mr. Satish Kumar Director Tata 1mg who was One of the speaker also shared his experience of the Natcom."The National President Mr Meena gave brief about the support provided by all the branches for their support.

CHANDIGARH BRANCH

Pleased to share that' Indian Institute of Materials Management organised one day inhouse training program on Strategic Sourcing for Purchase professionals of SMLISUZU at Ropar Pb. More than 30 professionals participated in the program. Mr Chanana Chief G.M. operation welcomed the faculty ànd appreciated the role of IIMM in sharpening the skills on various aspects of Supply Chain Management. Mr Rajiv Puri CPO SMLISUZU emphasised on training needs ànd thanked IIMM for conducting 3rd program in the last six months. Myself ànd Mr Kiran Rampal Vice Chairman of Chandigarh Branch were faculty members. Need the importance of Strategic Sourcing, process, advantages and disadvantages of S.S. along with various case studies and examples from Auto industry were shared with the participants. The program was appreciated by all.

EXECUTIVE HEALTH

Nature is rainbow coloured

KALPISH RATNA

If plants can thrive on difference, why can't *homo sapiens*?

There is a rainbow on my kitchen counter—scarlet tomatoes, amber-in-the mud potatoes, emperors-in-purple slumming as brinjals, a Mardi Gras frolic of bell peppers mauve, green and gold.

The street below my window is a rainbow surge too, a Moebius strip of shifting hues, a Monday morning world on the move.

I usually resent such parallels, but today's headlines make this a comparison I can no longer avoid.

That rainbow on my counter is crowded with diversities of colour, texture, taste, terroir. What do you think is their common denominator?

The rainbow on the street is no different. Judging from our passive endurance of hate and prejudice, for all our visible plurality, our species also has poison as a common denominator.

These vegetables—potato, tomato, brinjal—are common human fodder, but they come from plants that manufacture lethal toxins as defence. They belong in the crowded genus *Solanum*, which holds more than 1,500 species and is still expanding.

Solanum's ambiguity is contained in its two common names. *Solanum* derives from the sun, and implies something warm and nourishing. The other name in the *Solanaceae* family album is Nightshade, which tells a darker tale. How can we reconcile the two?

In evolutionary terms, the past is a bad place to be, and that rainbow collection awaiting delectation decided on becoming poisonous as far back as 120 million years ago.

Is evolution cynical?

All poison begins in distrust, and evolutionary studies in plant defences have shown, it is never as simple as that. The distrust originated at an ancient moment of interaction with a perceived enemy; circumstances, climatic and local, defined the enmity. The plant's defence was against herbivores and insects—we humans hadn't entered the landscape yet.

The world's most popular *Solanum*, the potato, was cultivated from wild populations in the central Andes of Peru and Bolivia sometime between 6,000 and 10,000 years ago. So too was an equally ancient Chilean population that arose from the hybridisation of the Andean with a wild species, *Solanum tarijense*, found in southern Bolivia or northern Argentina. These originals must have been very different in taste and texture from *aloo*, and would have contained much more of the toxic glycoalkaloids, solanine and chaconine.

Today we only encounter "potato poisoning" when the harvested tubers are stored in bright light and allowed to sprout. The tuber senses an approaching danger and trots out a fresh batch of toxins. A millennium of cultivation has taken the poison out of the potato, and now that the enzyme complex responsible for manufacturing these toxins has been identified, we shall soon be eating potatoes that are entirely innocuous.

The submerged history of the lesser-known *Solanums* is even more revealing. In the Americas, Asia, and Africa, these endemic plants have long been medicine and food to indigenous populations labelled as "tribal" or aboriginal. For centuries, *solanums* we dismiss as "toxic" have been processed and consumed safely by these cultures. It is their treasury of knowledge that tomorrow's medicine must trust.

The tiny berries of *Solanum nigrum* (*makoa*, *manathakkali*) have been part of Indian cuisine for centuries. The black and red berries pop with tart flavour—but children are cautioned against nibbling the leaves or eating the green berries. The sun-dried berries, fried in a drop of ghee, give a piquant fillip to the most work-a-day sauce or gravy. Poison? No way!

It is in Australia, where new plants are being discovered, that the *Solanum* really becomes comprehensible. To me these revelations go way beyond botany. They are the new gospels of belief that might yet redeem the stalled evolution of *Homo stultus*.

On January 20, the new US President declared, in his inaugural address: "As of today, it will henceforth be

the official policy of the United States government that there are only two genders: male and female."

The humble Dungowan bush tomato, from the monsoon tropics of northern Australia, refutes this asinine certainty. "*Spiny Solanums*" have diversified over the last 10 million years. While the diversity of leaf, flower and fruit is evident to the casual observer, scientists have been so intrigued by its variable reproductive strategies that it has been named *Solanum plastisexum*.

The plant, discovered 50 years ago, defied classification simply because science refused to accept its changing sexual orientation, or to quote the researchers who deciphered the mysteries of this plant:

"Some of the confusion surrounding this taxon relates to the botanists' inability to clearly identify its breeding system due to the species' non-conformity to any one floral form and/or inflorescence type.

Solanum plastisexum is a new species … (it) is also evidence that attempts to recognise a 'normative' sexual condition amongst the planet's living creatures is problematic. When considering the scope of life on Earth, the notion of a constant sexual binary consisting of distinct and disconnected forms is, fundamentally, a fallacy."

The *solanums* awaiting my knife compel me to reconsider my own species. If their lethal poisons could be educated by understanding, surely ours can be too? What magic will it require to trick humanity out of the cruelties of caste, the sneering stupidities of religion, the sullen hate of prejudice against language, skin colour and geography?

Solanums, global citizens all, sustain humanity with the plurality of being, their poison transmuted by intelligence. Can we not use our own plurality of being to evolve towards sapience?

Kalpana Swaminathan and Ishrat Syed are surgeons who write together as Kalpish Ratna. They are the authors of Gastronama: The Indian Guide to Eating Right (Roli, 2023).

Source: frontline.thehindu.com

●●●

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.

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

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