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THE INDIA–US FORUM

Report

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India-US Strategic Partnership: Navigating Geopolitical Flux

The India-US Forum 2025 convened at a pivotal moment, bringing together senior representatives of both nations to chart the course of one of the most consequential bilateral relationships. The Forum offered unprecedented insights into how both countries view their partnership amid global uncertainty.

Strategic Autonomy in a Multipolar World

India's evolving approach to strategic autonomy distinguishes it from its Cold War-era non-alignment policy. This approach acknowledges that in the emerging global architecture, traditional hedging strategies become increasingly difficult when dealing with technology partnerships which require deep trust.

The analysis suggests that the new world order will be defined by technology capabilities and technology partnerships rather than by the traditional pillars of military alliances and economic arrangements that characterised the post-War system of the twentieth century. This technological centrism creates both opportunities and constraints for countries seeking to maintain autonomous decision-making while accessing critical capabilities.

However, the discourse around strategic autonomy reveals interesting patterns. Every country, regardless of size, attempts to maximise its autonomy based on available resources - whether it is small island nations such as the Maldives and Sri Lanka, or major powers. This focus on autonomy is not specific to India; rather, it reflects a basic and universal principle in international relations: that countries naturally seek to preserve their ability to act independently while still engaging in partnerships to access essential needs. More significantly, examining India's current dependencies reveals constraints primarily from two relationships: dependence on Russia for approximately 70% of its military arsenal, and on China for manufactured inputs across sectors.

Military Partnership: Breaking through Bureaucratic Barriers

The defence dimension of India-US relationship has achieved unprecedented momentum, with discussions around fifth-generation fighter technology marking a significant shift, something many experts considered impossible just a few years ago. The ongoing discussion regarding F-35s reflects the administration's broader philosophy of making "American defence equipment" more accessible to strategic partners while addressing bureaucratic limitations that have historically constrained cooperation.

Defense Industrial Collaboration

Priorities include Reciprocal Defense Procurement Agreements (RDPA), co-production arrangements, and International Traffic in Arms Regulations (ITAR) reform initiatives.

The framework encompasses pending sales including Javelin anti-tank missiles, Striker armoured vehicles, and additional P-8 maritime patrol aircraft, with officials emphasizing the need to complete existing agreements to unlock more advanced cooperation opportunities.

The establishment of an Autonomous Systems Industry Alliance (ASIA) indicates movement toward collaborative development in emerging defence

technologies, particularly subsea and aerial systems critical for Indo-Pacific security. This industrial cooperation model attempts to reconcile "Make America Great Again" with India's "Make in India" through component-level collaboration and maintenance, repair, and overhaul partnerships.

The transformation in the American approach becomes evident when considering that as recently as the first Trump administration, US bureaucracy was still calculating "balance of power impacts in South Asia" for defense equipment India sought to purchase for other borders.

Technology Competition and Strategic Dependencies

A comprehensive technology assessment reveals both India's remarkable capabilities and the challenges posed by China's technological dominance. China's artificial intelligence ecosystem, comprising over 4,500 companies, nearly half the world's top undergraduates in artificial intelligence (AI), and state-backed investments exceeding $15 billion, presents a massive scale of ambition backed by centralised policy instruments.

China's Technological Architecture

China's approach across technology verticals demonstrates systematic integration of state investment, centralised policy, and industry alignment. In AI, the goal of becoming the world's innovation centre by 2030 is supported by extensive open-source large language module (LLM) initiatives like DeepSeek R1, and massive talent development programmes. However, the requirement for AI service providers to "ensure conformity with socialist values" reveals the political constraints embedded in technological development.

The quantum technology domain shows similar patterns with China's deployment of the MISIUS satellite, a 12,000-kilometre quantum communication backbone, and advanced processors like the Suchong-3 demonstrating operational advantages. The Suchong-3 system operates an order of a magnitude faster than the world's most powerful supercomputer and one million times faster than Google's Willow processor.

In semiconductors, China has committed over $150 billion since 2015 toward technological self-reliance, achieving impressive gains across different subsectors despite uneven progress. The digital economy architecture through WeChat, Alipay, a state-backed digital yuan, and blockchain-based service networks creates tightly controlled but widely used financial systems designed to facilitate direct cross-border transactions without reliance on established channels.

The fundamental challenge becomes apparent: while technology development has historically been agnostic of geopolitics, the use of technology however cannot be similarly neutral given evidence of how economic and technological dominance serve as instruments of political coercion.

India's Technology Response Strategy

India's counter-strategy operates across three dimensions: building sovereign AI ecosystem capabilities through the $1.2 billion India AI Mission, developing trusted partnerships with like-minded democracies, and enabling partners of the Global South to leverage AI developments for

developmental goals. The India AI Mission's response exceeded all expectations, receiving over 240 proposals compared to an anticipated five or six, indicating substantial domestic capability and ambition.

India's data advantages include substantial repositories of over 1.4 billion people, growing internet penetration, and expanding digital public infrastructure. The country possesses nearly 14% of the global AI talent pool and new-age data startups, while democratic governance enables active participation in global discussions on data privacy, sovereignty, and strategic autonomy.

The quantum technology domain presents similar dynamics. India's National Quantum Mission, approaching $1 billion in investment, focuses on indigenous capability development while integrating with global research networks, particularly through trust frameworks with partner nations. Initiatives include co-funding joint fellowships in quantum physics across leading institutions and creation of Indo-Pacific quantum technology consortiums aligning startup, laboratory, and government R&D priorities.

Semiconductor Strategic Vulnerabilities

The semiconductor access issue represents perhaps the most immediate constraint on India's

technological ambitions. Current export control regulations place India in Tier 2 status alongside 150 countries, limiting her access to advanced computing hardware essential for AI development. The quota system restricts India's allocation to

approximately 19,000-20,000 next-generation B200 chips over the next several years, insufficient for training multiple LLMs or supporting population-scale inference applications.

This inadequacy becomes evident when considering that this system treats India at par with countries with vastly different population scales, digital adoption rates, and strategic importance. Countries like Bhutan with 700,000 people or the Solomon Islands with 800,000 people have the same quotas as India which has a population of 1.4 billion and a massive digital ecosystem.

The semiconductor challenge extends beyond quotas to fundamental supply chain resilience. India's strategy focuses on ecosystem creation: design, testing, packaging, and talent development for global markets, relying on trusted and distributed supply chains. India provides nearly 20% of global semiconductor design talent, rapidly growing electronics markets, and unprecedented government support.

If all major economies accept the need for trusted semiconductor sources, particularly for defence, telecommunications, power, and sensitive applications, India's position becomes compelling. The world trusted India with data during the IT revolution, so similar trust should extend to semiconductor manufacturing through the development of trusted foundry protocols and secure chip design for critical infrastructure.

Economic Partnership: From Aspiration to Implementation

Trade relationship has attained a new urgency with both sides committing to complete a bilateral trade agreement by the fall of 2025. The terms of reference have been finalised, with negotiations proceeding through a two-tranche structure targeting specific sectoral agreements. The "Mission 500" objective - doubling bilateral trade from the current $210 billion to $500 billion by 2030 - provides a concrete framework for measuring progress.

Strategic Trade Rationale

India's export potential and economic partnerships reveal that unrealised areas are concentrated largely in Western markets. Business analysis consistently identifies that the most mature, predictable markets with greater reliability and fewer non-tariff barriers offer the highest growth potential - primarily the United States, United Kingdom (UK), and Europe.

The contrast with India's existing Free Trade Agreements is instructive. Most FTAs over the past 25 years have been with Southeast Asian and East Asian economies that have greater trade barriers, less openness, limited growth potential, and highly competitive products and services. From both business and strategic perspectives, prioritising US, UK, and EU trade relationships makes compelling sense.

The strategic dimension adds another layer of rationale. The past 25 years have seen the balance skewed eastward, creating the need for rebalancing that extends beyond Western countries to include partnerships in the Gulf region – with UAE, Oman, and potentially the Gulf Cooperation Council. This diversification will serve both economic optimisation and strategic risk management.

Tariff Dynamics and Strategic Calculations

While universal tariff policies initially raised concerns, the relationship's resilience extends beyond trade friction. The impact of the tariffs depends to a great extent on the substitutability of exports and competitive positioning relative to other suppliers, suggesting that India's unique capabilities in certain sectors provide negotiating advantages.

The complexity extends beyond simple tariff calculations to include competitive dynamics. If competitors face worse tariff treatment, relative positioning may actually improve despite absolute increases in trade costs. The nature of exports also matters significantly - products that are non-substitutable or have limited alternative suppliers have advantages regardless of tariff levels.

The broader economic relationship encompasses energy cooperation, particularly civil nuclear technology, where parliamentary amendments to the Civil Nuclear Liability and Damage Act could unlock American nuclear technology for India's ambitious 100-gigawatt nuclear expansion plans. Budget statements indicate government commitment to necessary legislative changes for both nuclear liability reform and private sector participation through amendments to the Atomic Energy Act.

The civil nuclear relationship illustrates broader partnership potential. The original Bush-Singh agreement was signed nearly two decades ago, yet American nuclear technology still hasn't reached the world's largest potential market due to liability framework issues. The current administration's commitment to resolving this

impasse could finally unlock small modular reactor (SMR) technology for India's energy transition.

Geopolitical Realignment and Alliance Structures

The forum's discussions revealed fundamental shifts in global strategic architecture, with traditional alliance systems facing unprecedented challenges. Analysis highlighted the administration's turning away from "underpinning a favourable military balance in Europe" toward emphasizing homeland defence and Indo-Pacific positioning, creating the space for India's enhanced regional leadership role.

Global Order Transformation

The international liberal order established seven decades ago has reached its "tether's end," giving way to arrangements that are more national, regional, or plurilateral rather than truly international. The emerging system is inclined toward conservative approaches emphasizing nationalism, national interests, and economic protectionism rather than liberal internationalism. Most significantly, this represents a transitional period of disorder rather than an established alternative order.

Within this transformation, different regions experience varying impacts. European nostalgia for the old order reflects its comfortable position within previous arrangements. American ambivalence partly reflects internal polarisation and differing views on global engagement. China clearly benefited from the old order, having "gamed the trading system" while enjoying UN Security Council membership and building advantages as a non-market economy operating within market systems.

For India, the assessment proves more complex. While the country did rise economically under the previous order, it also faced significant disadvantages. The "prescriptive nature of the old order" saw certain countries and institutions positioning themselves as arbiters, setting benchmarks and passing judgments on others. This created regular pressure on countries seen as non-conforming to preferred models.

Values-based Realignment

Beyond strategic and economic calculations, a deeper transformation involves values-based cooperation. The current American approach recognises the necessity of viewing global tensions through the prism of values rather than merely strategic interests. This involves discussions about democratic versus authoritarian systems, market-led versus state-led growth models, and broader questions about the West's role in global affairs.

Trump 2.0 seems clear about wanting to restore American hegemonic power while constraining China's influence with access limitations in the consumer market and technological restrictions. However, this approach extends beyond traditional power competition toward explicit values-based cooperation with countries sharing democratic principles and market-oriented approaches.

This creates opportunities for India as an "extremely important strategic partner" in ways that transcend traditional trade or security arrangements. The commonality of values provides the foundation for sustained cooperation that can withstand temporary policy differences or economic friction.

Evolution of Quad and Maritime Security

The Quad partnership has evolved from humanitarian assistance towards broader security cooperation, with India scheduled to host the Leaders Summit in the fall of 2025. The framework enables strategic conversations that would be impossible in other formats, allowing four like-minded countries to coordinate responses to shared challenges.

Specific Quad achievements include tracking of Song-class submarines in the Indian Ocean and implementation of the Indo-Pacific Maritime Domain Awareness (IPMDA) system using advanced data fusion. These operational collaborations represent evolution beyond development projects towards practical security cooperation without formal military alliance structures.

The framework's maturation includes semiconductor supply chain resilience planning, critical minerals cooperation, and subsea cable security - all domains where technology security intersects with economic security. However, officials acknowledge the need to rationalise the proliferation of working groups and focus on four or five priority areas rather than the current 14 or 15 special committees.

This relationship's China dimension operates across multiple levels - from economic competition to values-based cooperation. Mainstream thinking in both countries has evolved significantly over the past decade, reflecting growing strategic clarity about the fundamentally competitive nature of US-China relations.

The historical perspective is illuminating. India's advocacy for China in earlier decades motivated by fears of the dangerous global conditions created by US-China opposition were replaced by opposing concerns when the US-China rapprochement in 1971-1972 created strategic vulnerabilities of a different nature. Today's approach emphasizes evaluating relationships "on merits" rather than maintaining an artificial equivalence.

Unlike past preferences for keeping equivalence as "smart strategy," the current approach examines where problems and profits exist, and which partners offer deep commonality rather than fundamental

differences. This approach provides the flexibility for differentiated engagement based on interest convergence rather than on ideological consistency.

Technology Governance and Democratic Values

The current moment presents unique challenges because "non-Western technologies" are emerging. These technologies are often created by individuals but have global impact, making it hard for democratic societies to regulate them. This is not just about shifting economic power, but also about clashes between different values and ideologies built into these technologies.

Democratic vs. Autocratic AI

The distinction between democratic and autocratic AI is centred on fundamental questions of human empowerment versus control. Democratic AI serves people by increasing access to information, enhancing capabilities, and creating opportunities for prosperity and job creation. Autocratic AI systems on the other hand surveil, censor, and determine what people should see, hear, and do, treating technology as instruments of social control.

This dichotomy explains the varying attitudes toward the adoption of AI. Americans and Europeans often express negativity and fear about AI applications, while countries like India demonstrate greater optimism. The difference reflects the dystopian narratives that have shaped Western discussions on AI versus the developmental narratives that emphasise AI's potential for inclusion, service delivery, and economic advancement.

The challenge therefore is to ensure that AI development follows empowerment models rather than control paradigms. This requires collaboration between countries sharing democratic values to show that AI can enhance human agency rather than constrain it.

Regulatory Philosophy and Innovation

India's regulatory approach emphasizes pro-innovation policies rather than restrictive oversight, a contrast with European models that are characterised as "heavy-handed." The Data Protection Act framework focuses on free flow of data with consent-based controls, while sectoral regulators retain discretion for specific data residency requirements in exceptional circumstances.

The AI governance philosophy reflects confidence in application deployment rather than fear-based restrictions. This evolution demonstrates shifting priorities toward positive technology deployment while maintaining appropriate safeguards. Rather than heavy legislation, the preference is for techno-legal solutions, with technical tools proving more effective than regulatory frameworks for preventing societal AI risks.

Specific examples include AI safety institutes developing technical tools for harm detection, with institutions creating world-class detection systems that provide more effective protection than broad legislative restrictions. This technology-centric approach prevents harms while maintaining innovation momentum.

Strategic Challenges and Implementation Pathways

Despite the India-US relationship's overall trajectory, significant challenges require careful navigation. The student deportation issue, affecting approximately 50% Indian nationals among recent deportees, threatens one of the relationship's foundational elements - the mobility that has "transformed" bilateral ties more than any other factor.

Neighbourhood Dynamics and Regional Stability

Regional stability concerns, particularly regarding Bangladesh, represent areas where American policies and Indian interests have not always been aligned. The pointed reference to Bangladesh as an example concerning American actions in India's neighbourhood, illustrates the complexity of managing global power dynamics in regional contexts.

However, the current administration's approach suggests different priorities. The emphasis on "America First" focuses primarily on national interests, combined with an explicit rejection of "preaching about internal politics," indicates

reduced interference in domestic political arrangements of partner countries. This represents a departure from what some characterise as "woke ideology" in foreign policy that actively supports groups seen as hostile to conservative governments.

Efforts to reorganize the State Department explicitly focus on American interests. This creates a space for interest-based cooperation rather than values-based interference, potentially reducing friction in regional relationships.

Implementation Timeline and Deliverables

The Fall 2025 timeframe presents multiple convergent opportunities: completion of the bilateral trade agreement, President Trump's visit to India, and the Quad Leaders Summit. This concentration of

high-level engagements creates the potential for significant deliverables while requiring careful coordination to ensure substantive outcomes rather than merely ceremonial achievements.

The emphasis on using joint statements as "forcing functions" reflects results-oriented approaches with success measured by concrete achievements in defence cooperation, trade expansion, and technology collaboration rather than aspirational commitments.

Specific expectations include major Indian corporate investment announcements during the

presidential visit, potentially modelled on multi-billion dollar commitments similar to the Stargate initiative. Such announcements will demonstrate private sector confidence while also supporting job creation priorities important to the American administration.

Future Architecture and Strategic Vision

The relationship's evolution occurs within a broader transformation of the global order characterised as moving from an "international liberal order" towards more national, regional, and plurilateral arrangements. This transition will throw up both opportunities and uncertainties that will require adaptive strategies rather than adherence to traditional diplomatic approaches.

Diaspora as Strategic Asset

The Indian American community's role extends beyond economic contribution towards facilitation of a strategic partnership. Personal narratives illustrate the community's integration into the American strategic establishment, from longest-living Indian Army pensioners to Silicon Valley leadership to

national security positions.

The community's evolution from circumspect identity management in earlier decades to proud heritage embrace reflects India's rising global stature. This transformation provides the foundation for enhanced cooperation while creating expectations for continued mobility that enables technological and economic partnership.

Silicon Valley perspectives reveal specific expectations for major corporate commitments during high- level visits, with recommendations for Indian companies to announce substantial American investments and create employment opportunities. This reflects the understanding that presidential priorities include demonstrable job creation and economic development.

Long-term Strategic Trajectory

Optimism about the relationship's trajectory over the next four years and beyond reflects convergence on major global issues including stability in the Middle East, Indo-Pacific security, and Russia-Ukraine dynamics, even where positions are not identical. The assessment that "what we agree on vastly exceeds whatever differences we may have" provides the foundation for sustained cooperation despite occasional disagreements.

India-US relationship's technology-centred future requires resolution of mobility issues, maturation of defence partnership, and a collaborative approach to emerging challenges including AI governance, quantum technology development, and semiconductor supply chain resilience.

Critical near-term priorities include civil nuclear liability amendments enabling SMR technology deployment, revision of AI diffusion rules to reflect strategic partnership realities, and completion of defence agreements that unlock advanced cooperation opportunities. Success in these domains will determine whether the partnership achieves its potential as "the most important relationship" of the century.

Strategic Autonomy Redefined

The practical application of strategic autonomy requires recognising that the comprehensive development of national power - economic, technological, and military - depends significantly

on partnerships with countries possessing complementary capabilities. Rather than an abstract principle, strategic autonomy becomes the practical question of building capabilities that enable effective navigation of changing global conditions.

The example of infrastructure development proves illustrative: building roads in the Himalayan border areas requires tunneling machines but Chinese restrictions on equipment sales demonstrate how dependencies constrain strategic options. Similarly, the development of renewable energy capacity faces the problem of limited access to equipment.

The answer lies not in avoiding partnerships but in negotiating terms of engagement that build long-term capabilities while maintaining decision-making autonomy. This requires recognising that India's scale and importance enable negotiation of favourable partnership terms rather than acceptance of dependent relationships.

Conclusion

The India-US Forum 2025 revealed a relationship at an inflection point, with both democracies recognising the imperative for deeper cooperation amid global technological competition and geopolitical uncertainty. The strategic compact framework provides practical mechanisms for collaboration while respecting each nation's autonomous decision-making processes.

The Forum's discussions demonstrated remarkable convergence on fundamental challenges - China's technological rise, the need for democratic technology alternatives, and the importance of economic partnership for mutual prosperity. Yet it also revealed the complexity of managing great power relations in an era where traditional diplomatic tools prove insufficient for addressing technology-driven transformation.

The relationship faces a unique moment where American recalibration of global commitments creates space for enhanced partnership, Indian technological capabilities mature rapidly, and shared challenges require coordinated responses. The administration's clarity about strategic priorities, combined with India's pragmatic approach to partnership development, provides the foundation for sustained cooperation.

Success will require sustained commitment from both leaderships, effective implementation of agreed frameworks, and continued adaptation to rapidly evolving global circumstances. The Fall 2025 Summit presents opportunities to demonstrate that democratic partnerships can effectively compete with authoritarian alternatives while preserving the values and principles that define both societies.

The relationship's ultimate test lies not in managing current cooperation but in building institutional resilience that can withstand future political transitions, economic disruptions, and strategic challenges. The foundation established through the strategic compact framework provides reason for optimism, but only sustained implementation will determine whether this partnership will truly become definitive for the twenty-first century's geopolitical architecture.

The transformation from romantic expectations to realistic engagement, from ideological positioning to interest-based cooperation, and from dependent relationships to strategic partnerships reflects both countries' maturity in understanding global power dynamics. This evolution positions the relationship to serve not merely bilateral interests but broader goals of democratic resilience, technological advancement, and global stability in an increasingly uncertain world.


USA • INDIA
VICE PRESIDENT JD VANCE


VIRAT

Strengthening Ties: Vice President Vance's Address

In his virtual address to the India-US Forum, US Vice President J.D. Vance emphasized the growing strength of the India-US partnership built on shared interests, mutual respect, and a commitment to a prosperous future.

VP Vance highlighted India's vitality and focus on the future, contrasting it with the self-doubt seen in parts of the West. He stated that President Trump's administration prioritised growth, innovation, and fair global partnerships, positioning India as a key partner in this vision.

The Vice President announced that India and the US finalised the terms of reference for a comprehensive trade agreement, marking a critical step toward doubling bilateral trade to $500 billion by the end of the decade. The agreement focused on creating jobs, building resilient supply chains, and ensuring shared prosperity.

On defence cooperation, he noted that the US conducted more military exercises with India than with any other nation. He outlined plans for co-production of advanced defense equipment, including maritime systems and combat vehicles, under the new US-India Compact. He encouraged India to consider acquiring American fifth-generation F-35 aircraft to strengthen its air defence capabilities and reaffirmed support for deeper defence technology partnerships through India's status as a Major Defense Partner.

Energy collaboration was identified as another priority. VP Vance stressed the importance of affordable and reliable energy for manufacturing and economic independence. He welcomed India's steps to amend its civil nuclear liability laws, enabling US exports of small modular reactors and larger-scale nuclear technology. He also urged India to reduce non-tariff barriers to allow greater access for US energy products such as natural gas and ethanol, while pledging US support for developing India's domestic resources, including offshore natural gas and critical minerals.

On technology, VP Vance highlighted the launch of the US-India Trust Initiative, aimed at driving major investments in data centres, pharmaceuticals, undersea cables, and other critical sectors. He emphasized the complementary strengths of India's vibrant startup ecosystem and America's global technological leadership, underscoring the potential for joint innovation.

He reaffirmed the shared vision of a free, open, and secure Indo-Pacific, noting India's leadership role in the Quad and the region's importance for global stability. He stressed that deeper cooperation in defense, energy, and technology would be central to ensuring regional and global prosperity.

In closing, VP Vance stated that the trajectory of the 21st century would be shaped by US-India partnership. He expressed confidence that collaboration between President Trump and Prime Minister Modi would deliver lasting economic growth and security, making this century one of unprecedented peace and prosperity.


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Large Language Militaries: A Blueprint for U.S.-India Defence Partnership in the Age of Strategic Technology

As major powers recalibrate their national security architectures for an era defined by artificial intelligence (AI), autonomous systems, and contested space and cyber domains, the India-US defence partnership is undergoing its most consequential transformation since the Civil Nuclear Agreement. The emerging security order is not only multipolar but multi-domain, and no two democracies are better poised politically, economically, and technologically to shape its rules than India and the United States (US).

The Strategic Urgency of Algorithmic Warfare

The war in Ukraine has delivered a sobering lesson: traditional platforms alone no longer dominate the battlefield. Ukrainian forces, operating with limited air power and armour, have achieved disproportionate effects through AI-guided kamikaze drones, Low-Earth Orbit satellite imagery, and autonomous targeting systems. Notably, over half of the US-supplied Abrams tanks were reportedly disabled by low-cost drones. These shifts have turned Ukraine into a live-fire demonstration of the future of warfare, where software outpaces steel.

In addition to Ukraine, lessons from the second Nagorno-Karabakh conflict in 2020 between Armenia and Azerbaijan underscored the decisive role played by unmanned systems, loitering munitions, and precision-strike capabilities. Azerbaijan's use of Turkish and Israeli drones overwhelmed Armenian defences, emphasizing that nations with superior algorithmic warfare capabilities can secure rapid victories despite limited manpower or legacy inventories.

The implications for India and the US are profound. With both countries facing security challenges from technologically aggressive rivals, China above all, there is growing consensus that a "catch-up" mindset is no longer viable. Rather than acquisition of legacy systems, the priority must now be co-development and rapid deployment of algorithmically enabled platforms. The battlefield is no longer defined by control of terrain alone, but by control of the cognitive and digital domains.

Beyond Joint Statements: From Frameworks to Capabilities

The February 2025 joint statement by Prime Minister Narendra Modi and President Donald Trump marks a new high in bilateral defence ties. The unveiling of a 10-year strategic defence framework, the launch of the TRUST (Transforming the Relationship Utilizing Strategic Technology) compact, and the scaling of the Indus-X initiative (a collaborative effort between India and the United States focused on accelerating defence innovation and technology cooperation) form the institutional pillars of this transformation. Yet, the test lies not in declarations but in delivery.

What made the 2005 defence framework transformative was its linkage of high technology and trust-building. Today, the stakes are higher, with a focus not just on interoperability but on integration in the Indo-Pacific battlespace. This

includes not only co-producing platforms like the Javelin missile or P-8I maritime aircraft, but also architecting new systems in unmanned, cyber, and space domains.

The key upcoming deliverables include:

- Finalization of the Reciprocal Defense Procurement Agreement (RDPA).
- Co-production scaling of platforms such as the Stryker, MH-60R helicopters, and F-16 components.
- Operational launch of ASIA (Autonomous Systems Industry Alliance).
- The next Indus-X Summit focusing on start-up and dual-use innovation integration.

To operationalise a next-generation defence partnership, India and the US must jointly invest across a spectrum of emerging and contested domains. Drawing on strategic dialogues and expert consultations, six priority areas have been identified as foundational to achieving joint dominance. These domains represent both the vulnerabilities that adversaries could exploit and the opportunities where India-US collaboration can deliver asymmetric advantage:

1. Space and Undersea Awareness: With China aggressively investing in anti-satellite weapons and undersea capabilities, Indo-US partnership must now go beyond surface warfare. Collaborative initiatives on Synthetic Aperture Radar (SAR), Electronic Intelligence (ELINT) satellites, and unmanned undersea sensors are being explored. USA's experience in Intelligence, Surveillance, and Reconnaissance (ISR) and India's success in cost-effective satellite engineering make this a potential domain for partnership.

2. Cybersecurity and Quantum Resilience: Bilateral deterrence will depend not just on missiles and satellites, but on code, compute, and cyber warriors. The looming obsolescence of current encryption methods due to breakthroughs in quantum computing necessitates joint effort in post-quantum cryptography. Meanwhile, India's nascent cyber commands need integration with US best practices in active defence, red-teaming, and incident response. Beyond hardware, the less visible domains of cyber and quantum technologies are rapidly becoming theatres of asymmetric advantage. The emergence of AI-enhanced malware and quantum decryption pose existential risks to assets ranging from submarines to encrypted communication. India and the US must institutionalise bilateral cyber operations—including real-time threat intelligence sharing, joint red-teaming of critical infrastructure, and shared cyber exercises simulating attacks on civilian infrastructure. These collaborations must extend to building post-quantum encryption protocols and offensive cyber capabilities aligned with international norms.

3. AI-Driven Battle Management: Inspired by the US JADC2 programme, India aims to build sovereign battlefield data fusion systems. But severe hurdles remain: a procurement process tailored for hardware, siloed data-sharing norms, and lack of in-service feedback loops. A new India-US working group to prototype AI-driven command systems may be a useful platform.

4. Swarming and Autonomy: India has developed indigenous loitering munitions and UAVs (unmanned aerial vehicles – aircraft piloted by remote control or onboard computers), but lacks testing corridors, simulation labs, and doctrinal maturity. US support in test infrastructure, paired with India's design-for-cost innovations, could enable rapid proliferation of swarming assets.

5. Spectrum Warfare: The electromagnetic spectrum has emerged as the new battlespace, with electronic warfare and signal jamming gaining tactical primacy. Collaborative R&D on resilient communications and passive detection systems was strongly urged.

6. Interoperability and Logistics: Beyond shared exercises, there is a need for co-location of logistics nodes, modular sustainment models, and integrated training systems. Given the Indo-Pacific's vast geography, the logistics angle could become the Achilles's heel in the absence of shared investment.

Breaking Gridlock: Rewriting the Procurement Playbook

Despite having a shared vision, regulatory barriers persist. Indian defence acquisition remains governed by the Defense Acquisition Procedure (DAP), which is under revision. Meanwhile, US firms face challenges navigating International Traffic in Arms Regulations (ITAR) and export restrictions that impede even non-sensitive co-development.

One breakthrough cited was the US Defense Innovation Unit's adoption of "commercial solutions opening" contracts that cut acquisition time to

under six weeks. India can replicate this model within its start-up ecosystem. Moreover, both governments were urged to pursue regulatory reciprocity: Indian companies should access US defence markets just as American firms do in India.

Perhaps, most critically, intellectual property regimes must evolve. Without shared IP and co-design rights, India remains relegated to assembly lines rather than leadership in innovation. Build-to-print manufacturing may support industrial growth but it does not create sovereign technological advantage. Strategic parity requires co-design, co-development, and shared access to innovation pipelines.

The proposed reforms include:

- **Procurement Modernisation:** Simplify acquisition procedures, especially for software and autonomous systems, through fast-lane contracting similar to the US Defence Innovation Unit model.
- **Reciprocity in Access:** Allow Indian firms to compete in US defence procurements, and ensure that Indian-developed tech, even if built abroad, remains accessible to Indian forces.
- **Regulatory Clarity:** Accelerate ITAR exemptions for commercial dual-use technologies and embed co-development agreements outside traditional arms frameworks.
- **Human Capital Exchange:** Launch joint fellowships, exchange postings, and co-training programmes in AI, cyber, and space domains.
- **Institutional Speed:** Embed start-up participation in defence R&D on both sides and eliminate lag-inducing inter-ministerial review procedures.Strategic Sovereignty through Industrial Collaboration

There have been a number of milestones in India's defence industrial ecosystem. The Tata-Airbus C-295 programme of building a full aircraft from ingot to flight in India and Lockheed Martin achieving 94% indigenisation of C-130J empennage production are some of them.

But India's ambitions go beyond domestic assembling or technology transfer. True sovereignty requires the ability to design, test, and export from India. The long-term vision requires more than policy alignment; it demands co-investment in infrastructure, particularly in compute and hardware. While the US leads in frontier semiconductor design, India's ambitions in mature node fabrication (e.g., Micron and Tata collaborations) will play a critical role in insulating global democracies from over-reliance on Chinese supply chains.

Furthermore, joint development of electromagnetic systems, space-based sensors, and undersea domain awareness platforms were emphasized as opportunities where the combination of American R&D and Indian engineering scale can offer asymmetric advantages.

A key recommendation was the establishment of global production hubs based in third countries, notably in Africa and the Indo-Pacific, that serve both geopolitical and industrial ends. These ventures could provide employment, training, and influence in regions where both countries seek strategic footholds.

On a separate note, venture capital has quietly become one of the most decisive forces in shaping the future of US defence innovation. With over $200 billion now flowing into dual-use start-ups spanning AI, aerospace, autonomy, and cybersecurity. Private capital is accelerating technologies that once relied solely on government laboratories. For India to stand shoulder to shoulder with the United States in next-generation defence development, it must build a comparable innovation-finance ecosystem. Without such a foundation, India risks a continued drain of its top talent into civilian tech or overseas ventures, forfeiting the opportunity to anchor critical capabilities at home.

U.S.-India AI Cooperation and Strategic Imperatives

India's AI mission, especially in hardware development, requires foundational policies to enable effective US-India collaboration.

Early US-India defence cooperation, including agreements like Communications Compatibility and Security Agreements (COMCASA) and Basic Exchange and Cooperation Agreement (BECA), illustrate that multi-year timelines, often averaging six years, are incompatible with the pace at which AI is developing.

Technology should serve as a new strategic axis in the bilateral relationship. The private sector must lead while governments focus on enabling

conditions by eliminating policy barriers. Rapid advancement in AI for military, intelligence, and economic applications depends on harnessing private sector agility.

AI in Military Applications: Opportunities and Frameworks

Artificial intelligence is rapidly redefining military capability, echoing historic shifts such as the post-World War II nuclear architecture and the military transformations that followed the terror attacks on 9/11. Contemporary conflicts from the battlefields of Ukraine to asymmetric operations in Yemen demonstrate a profound evolution in the character of warfare.

Leveraging Open-Source Intelligence (OSINT) enables the creation of common operating pictures that drive rapid, scalable military responses. The private sector plays a central role in supplying these tools, offering agility that can bypass traditional bureaucratic bottlenecks in data sharing. This capability holds particular value across East and Southeast Asia where rapid situational awareness is a strategic imperative.

The integration of AI into weapons platforms across land, air, and sea defines the next frontier in defence innovation. Deployment must proceed on an accelerated timeline with the end of the decade as a key benchmark. The roadmap includes shared software architectures, collaborative use of AI models, and scalable off-the-shelf systems. Industry leaders like Palantir and Rhombus Power already offer viable examples of this convergence.

Embedding AI in military exercises remains limited despite the frequency of bilateral drills. A structured framework for AI adoption addresses this gap through a phased model:

- **Category 1:** Back-office functions such as human resources and logistics
- **Category 2:** Intelligence collection and warning systems
- **Category 3:** Decision support in tactical and strategic operations
- **Category 4:** Lethal autonomous systems

Future militaries will depend on human-machine integration requiring tailored training, operational trust in AI systems, and institutional readiness to incorporate algorithmic decision-support into real-time planning.

Building a joint framework for AI-enabled weapons must account for ethical boundaries and geopolitical sensitivities—an effort where India's diplomatic leadership in the Global South can provide critical leverage.

Infrastructure and Strategic Models

India must overcome infrastructure limitations to compete with the rapid scale and valuation of US-based AI companies. While frontier model development may take time, immediate tactical adoption is essential.

Joint military exercises should incorporate AI-based tools, thereby creating opportunities to rewrite defence collaboration playbooks. Training programmes like "Gen AI for National Security" should be expanded to enhance readiness.

AI collaboration should bypass regulatory delays by focusing on domains outside ITAR constraints. While sensitive areas like undersea technologies may require formal agreements, most commercial or off-the-shelf AI applications can advance without triggering ITAR. Joint deployments, co-development, and procurement pilots should be launched under non-ITAR categories to accelerate cooperation.

Chinese open-weight models like DeepSeek pose a strategic challenge through demographic scaling, open-source diffusion, and PLA-aligned narrative shaping. Reciprocal digital ecosystem controls must be implemented; i.e., restricting access to platforms like DeepSeek - just as Chinese systems are barred from Western ecosystems. AI model diffusion that enables propaganda or undermines territorial sovereignty should be blocked through policy and technical safeguards.

From Rhetoric to Readiness

The adversary, that is China, is not waiting. From satellite constellations to AI cyber agents, Beijing is deploying a range of technologies designed for asymmetric dominance. China's strides in hypersonic glide vehicles, AI surveillance systems, quantum communications, and electronic warfare present a multi-domain challenge that could overwhelm conventional deterrence frameworks.

China has been aggressively expanding its military-civil fusion ecosystem where commercial advances in AI and computing are quickly transferred to military applications. The People's Liberation Army Strategic Support Force (PLASSF), established in 2015, has become the world's leading institutional body for integrated information warfare, cyber operations, and electronic countermeasures. China's deployment of BeiDou—a domestic satellite

navigation system—as an alternative to GPS, also signals its aim for strategic independence in precision targeting.

Moreover, Beijing is actively testing these capabilities through grey zone tactics in the South China Sea, Taiwan Strait, and along the Line of Actual Control. These actions blur the threshold between peace and war, forcing adversaries into a perpetual state of reactive posturing.

The lesson for India and the US is stark: if decision loops are dominated by adversarial AI systems and response mechanisms are shackled by bureaucracy then deterrence collapses. The future lies not in licensing foreign designs for local assembly, but in co-architecting platforms where both nations share the intellectual blueprint. Without co-ownership of intellectual property, India will remain a manufacturing node, not a strategic peer.

India and the US must adopt a wartime innovation tempo during peacetime. This means co-funding laboratories, fielding prototypes, accepting failure, and iterating quickly. Without these shifts, the next crisis will find the world's largest democracies outgunned not by platforms, but by processors.

The legacy of this defence alignment will not be judged by how many agreements are signed - but by how many algorithms are fielded, how many domains are mastered, and how many future wars are deterred by shared deterrence.

The playbook for 21st century strategic partnership is being written now. The time to read from it and act on it is running out.


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Navigating New Frontiers: India-US Collaboration in Commercial and Military Space

Once confined largely to the Indian Space Research Organisation (ISRO), India's space ecosystem has diversified significantly following the space reforms in 2020. A new generation of space-tech companies is now pushing boundaries in both strategic and commercial applications, reflecting a tectonic shift in how space capability is envisioned and executed.

Challenges of Bureaucracy and Policy Asymmetry

The biggest impediments to scaling space innovation lie not in competition but in regulation and bureaucratic inertia. Indian start-ups face prolonged procurement cycles of over two years, making it difficult to rely on the government as an anchor customer. In contrast, Digantara (a Space Situational Awareness start-up, which involves monitoring and understanding activities in space, including space debris and the position of satellites) earned over half a million dollars in the US within five months of launching operations there. A lack of clear procurement roadmaps in India, combined with policy hurdles, forces Indian companies to seek revenues abroad, thereby increasing the risk of reverse brain drain.

A further obstacle is the lag between innovation and regulation. Space being a dual-use sector, start-up ventures often collide with outdated policies designed for slower-moving legacy systems. Founders are navigating a world of 21st century technological needs constrained by 20th century regulatory machinery. Mistrust around data sharing and concerns about dual-use applications further complicate global engagement.

Navigating International Markets

The US market presents both opportunities and complexities. Indian companies must demonstrate value, and not merely offer cost advantages, to penetrate it. Strategic sectors demand differentiated capabilities. For example, an Indian space start-up GalaxEye's AI-enhanced synthetic aperture radar (SAR) data regeneration technology offers a unique advantage for surveillance in the tropics and cloudy geographies like the Indo-Pacific. Digantara, another Indian space start-up, has successfully integrated ground observatories in India, Kazakhstan, and Mongolia with the US Space Surveillance Network, contributing critical data on adversarial satellites.

Though Europe presents an alternative market, its strict procurement policies and preference for local entities make it harder to penetrate. A practical workaround in Europe is the use of local resellers, whereas in the US, Indian firms often need to establish independent subsidiaries and comply with rigorous licensing.

Pathways for Bilateral Collaboration

The next phase of India-US cooperation, as envisioned under the TRUST initiative (Transforming the Relationship Utilizing Strategic Technology), must move from pilot projects to scalable frameworks. Key expectations from both governments include:

- Building joint procurement mechanisms, especially for dual-use technologies.
- Encouraging projects like co-owned constellations between the US and Indian air forces.
- Establishing clear revenue visibility to unlock venture capital.
- Prioritising joint initiatives in AI, maritime surveillance, and Space Situational Awareness (SSA).

A successful example of such cooperation is Digantara's data-sharing integration with the US Space Surveillance Network. India, lacking its own national SSA system, benefits from this data exchange while helping the US close its sensor gaps in critical regions. Similarly, in AI-driven Earth observation, GalaxEye's offerings are well-suited to Indo-Pacific conditions, which are often poorly served by existing commercial satellites.

Scaling the Ecosystem: Policy and Strategy

To ensure meaningful progress, policymakers should avoid siloed strategies. Regulations must be co-developed with engineers and start-ups to ensure they reflect real-world innovation cycles. There is a pressing need to host decision-making dialogues not only in Delhi and Washington, but also in innovation hubs like Bengaluru, Chennai, Hyderabad, and Silicon Valley. Shared strategic priorities such as maritime security, missile defense, and SSA should guide collaborative investments.

There is an urgent need to move from "pennies to real dollars" in co-development projects. Previous experiments under DIU-DIO and Indus-X, while promising, lacked scalable procurement models. A sustained commitment from both governments, with defined roadmaps and funding structures, is essential.

Space in Wartime and the Future of Collaboration

As the line between peace and conflict blurs in space, companies are proactively designing wartime capabilities: building space-based infrastructure that can provide persistent SSA and missile warning independent of land-based sensors, exploring multi-modal solutions including SAR, thermal imaging, and HAPS (high altitude pseudo satellites) for contested geographies.

India's space start-ups are poised to play a pivotal role in shaping a more resilient and cooperative Indo-US space future. With aligned political intent, technology co-development, and reformed procurement strategies, the space domain can be a cornerstone of 21st century strategic partnership.

While Low Earth Orbit (LEO) congestion is a growing concern, current estimates suggest there is still capacity to grow. However, the lack of a global regulatory framework for space traffic management remains a critical gap. India and the US are working within multilateral fora but coordination among major spacefaring nations remains limited.

Building Strategic Resilience: India–US Technology Cooperation under the TRUST Framework

India–US bilateral relations have undergone a profound transformation, with technology emerging as its central axis. This transformation, years in the making, has seen the two nations evolve from mere buyers and sellers of defense equipment into partners in co-development, innovation, and the pursuit of resilient, trusted supply chains across critical and emerging technologies (CETs).

The journey began with the landmark Civil Nuclear Cooperation Agreement signed in 2008, a diplomatic breakthrough that unlocked high-level technology transfers to India. At that time, India's acquisition of US defense technology was negligible; today, it has surpassed $25 billion in contracts. This growth prompted the launch of the Defense Technology and Trade Initiative (DTTI) which, though ambitious, struggled due to mismatched expectations, limited private sector participation, and an absence of co-development habits.

To overcome these limitations, the Obama administration designated India as a "Major Defense Partner"—a bespoke status—and later the Trump administration elevated India to Strategic Trade Authorization (STA) Level 1, placing it on par with NATO allies in technology access.

From ICET to TRUST

January 2023 marked another leap forward with the creation of the Initiative on Critical and Emerging Technologies (ICET). This initiative encompassed fields such as artificial intelligence (AI), quantum computing, cyber security, 6G, semiconductors, defence, space, and biotechnology. Noteworthy outcomes include the US approval of an 80% technology transfer for GE F414 jet engines—the highest authorised to any country—including NATO allies, major investments by US companies in Indian semiconductor ventures, and space collaboration through the $1.5 billion NASA-ISRO NISAR satellite and astronaut training via NASA and SpaceX.

Despite concerns that the next US administration might walk back on ICET, the initiative has not only been sustained but rebranded as **TRUST—** Transforming the Relationship Utilizing Strategic Technology. TRUST is now seen as "ICET Plus," encompassing a broader scope with sharper emphasis on tangible outcomes.

TRUST: Focused and Forward-Looking

TRUST stands out for two reasons. First, it places clear emphasis on outcome-oriented cooperation, setting timelines, and aiming for early deliverables. Second, it broadens the scope to cover additional sectors including critical minerals, advanced materials, pharmaceuticals, and energy.

Recent Track 1.5 dialogues, held during the Global Technology Summit in Delhi, brought together senior officials, private sector leaders, and academics. These engagements laid the groundwork for the following priority actions:

- Encourage co-development and co-production across strategic sectors.
- Forge mutually supportive technology value chains.
- Build resilient supply chains, particularly in high-risk, high-dependency areas.

Strengthening Supply Chain Linkages

India and the US are reassessing their approach to globalisation, shifting from a narrative of open trade to one focused on "friend-shoring," trusted supply chains, and security-driven production models. This shift stems from sobering lessons during the COVID-19 pandemic and increasing geopolitical risks.

India, for instance, realised its heavy dependence on China for solar components (97% of solar ingots and wafers), tunnel boring machines, application programming interfaces (APIs), lithium-ion batteries, and coal gasification equipment. Such dependencies are not just economic risks—they represent national security vulnerabilities as well.

To address these, India must collaborate with reliable partners like the US and Japan through:

- Joint ventures and co-development in high-tech manufacturing.
- Shared R&D in sectors like clean energy and pharmaceuticals.
- Technology transfers in processing and value addition for critical inputs.

Artificial Intelligence

Despite early stagnation under ICET, AI is now central to TRUST. The February 2025 joint statement explicitly outlines a roadmap for accelerating AI infrastructure in India by the end of the year. It highlights market access, investment, and removal of constraints related to financing and energy demands. Crucially, the roadmap envisions enhanced access to high-end graphics processing units (GPUs) and AI compute resources which India currently lacks.

However, India has raised concerns about the US executive order that restricts AI chip diffusion. Classified in Tier 2, India faces an annual GPU cap of 17,000—far short of its projected requirements. This restriction risks undermining Indian ambitions as well as the ability of US companies to scale AI infrastructure in the region. India has formally requested a policy review to ensure fair and enabling conditions.

Critical Minerals

India is part of the Mineral Security Partnership (MSP), which includes the US, the European Union (EU), Japan, Australia, and others. Yet collaboration within the MSP has been largely informational rather than operational. To shift gears, India and the US have launched the Strategic Mineral Recovery **Initiative**, focusing on recovering and processing minerals like lithium, cobalt, and rare earths from industrial waste.

A critical challenge still remains: while mineral deposits are globally distributed, over 90% of global processing takes place in China. This chokehold is strategic—China recently imposed export restrictions on seven rare earth elements crucial to the US defence sector. To counter this, India and the US must:

- Co-invest in mineral processing technologies.
- Share R&D and intellectual property in refining methods.
- Establish regional processing hubs outside of China's orbit.

Pharmaceuticals

India is the world's largest supplier of generic drugs and home to the highest number of Food and Drug Administration (FDA)-approved facilities outside the US. Yet, its dependence on China for APIs and key starting materials remains dangerously high—over 70% for APIs and 90% for intermediates.

India and the US are beginning to address this via bilateral discussions and private sector engagement. Still, significant obstacles exist. US-based manufacturing is 3–5 times costlier and slower to build. To overcome these problems, the strategy should include:

- Shared production responsibilities: low-tech products in India; high-tech in the US.
- Guaranteed offtake agreements to support new facilities.
- Regulatory alignment and pricing controls to prevent market flooding by cheaper imports.

Advanced Materials

Although underexplored previously, advanced materials are now recognised as a strategic domain under TRUST. These materials are essential for next-generation defence, energy, and manufacturing technologies. India is looking to partner with the US, the United Kingdom (UK), and the EU to jointly develop new materials, build resilient supply chains, and avoid future dependencies.

To succeed, the following steps are critical:

- Foster deep academic collaboration with shared funding mechanisms.
- Encourage industry-academia linkages in both nations.
- Support joint commercialisation pathways.

Seizing the Opportunity

The TRUST framework offers a robust and strategic roadmap for India–US cooperation in critical and emerging technologies. But for it to succeed, both nations must commit to the following:

- Prioritise outcome-based deliverables across key sectors.
- Facilitate structured engagement between governments, industry, and academia.
- Promote co-development, not just technology transfer.
- Build durable, secure, and diversified supply chains.

As both nations navigate a rapidly shifting global order, their shared ambitions in technology will define not only bilateral success but broader global stability. TRUST, with its actionable agenda and strategic alignment, has the potential to become a cornerstone of a 21st-century partnership grounded in innovation, security, and mutual resilience.


Artificial Intelligence: Rulebooks and Playbooks
ABHISHEK SINGH
SANDEEP AURORA
HEMANT MOHAPATRA
SUNIL GUPTA
BEHNAZ KIBRIA
BECKY FRASER
SAURABH SINGH
AMLAN MOHANTY


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The Fragile Backbone of Global Commons: Securing Undersea Cable Infrastructure in an Era of Strategic Competition

In an era where geopolitical conflict is increasingly fought through supply chains, information networks, and invisible infrastructure, undersea cables have emerged as one of the most vital yet vulnerable arteries of global commerce and communication. Accounting for roughly 95-99% of all intercontinental data traffic, these fibre-optic cables form the real substrate of the so-called "cloud." Yet despite their strategic importance, they remain largely unprotected, inadequately regulated, and dangerously centralised, especially in countries like India, where critical digital flows are funnelled through a narrow sliver of coastline.

The vulnerabilities are not merely technical—they are systemic, regulatory, and geopolitical. As digital infrastructure becomes a central arena in the contest between state and non-state actors the question of who controls, protects, and governs the undersea commons is rapidly ascending from technical obscurity to the forefront of national security strategy.

A Strategic Blind Spot

India's $619 billion services trade in 2023–2024 relied overwhelmingly on submarine cables; 86% of that traffic transited through undersea systems. Yet all of this data is carried by just 17 cables, most of which land within a precariously narrow six-kilometre stretch of coastline in Versova, Mumbai. The implications are stark: a localised failure, whether accidental or deliberate, could cripple India's economy and paralyse government and military communications.

This is not hypothetical. In the Baltic Sea, 11 distinct incidents involving the New Polar Bear, Heaping 3, and Eagle S cables have occurred in just over a year. Whether caused by sabotage or mechanical failure, these events underscore the growing fragility of the global cable network. Similar vulnerabilities exist in West Africa and Southeast Asia, where single cable cuts have caused nationwide internet outages, underscoring how a seemingly minor physical disruption can produce cascading economic and strategic consequences.

Cable Disruptions as a Tool of Statecraft

For adversarial actors, undersea cables offer a low-cost, high-impact opportunity for coercion. Unlike satellites or terrestrial data centres, they lack persistent surveillance and are difficult to monitor in real time. Attacks can be easily disguised as fishing accidents or maritime mishaps. The ambiguity offers plausible deniability, making it a tempting frontier for gray-zone operations.

Yet, much like the early years of cyber security, the response mechanisms remain underdeveloped. Existing international legal regimes—rooted in frameworks like UNCLOS—are outdated, slow, and ambiguous about enforcement. Most repair operations are consortium-based and hinge on pre-negotiated commercial agreements, fragmented oversight, and sluggish multi-agency approvals. In India, the permit process for repair ships alone can stretch into months, turning minor outages into national-scale vulnerabilities.

The Repair Bottleneck

Cable repair is a logistical, bureaucratic, and geopolitical morass. Ships tasked with repair operations are few, expensive, and subject to intense geographic limitations. As one cable operator noted, even when ships are available, they are often delayed by transit speeds (typically 10–12 knots), flagging restrictions and permit bottlenecks

across multiple jurisdictions.

In India, repair operations require clearances from the Fisheries, Home Affairs, Maritime Security, and sometimes the Foreign Ministries—each layer adding weeks, if not months, to the process. Some repair permits in Asia take up to nine months to secure. And while the telecom industry has advocated for a single-window clearance mechanism, implementation remains slow.

To make matters worse, cable repair is increasingly being deprioritised by vessel operators. As the cable-laying business offers higher profit margins than repair, operators allocate resources to new projects rather than in maintenance—thus exposing users to prolonged outages.

Public-Private Convergence or Fragmentation?

Despite their national importance, undersea cables are largely owned and operated by private firms—Google, Meta, Tata Communications, and Airtel among others. This ownership model introduces both strengths and vulnerabilities. On one hand, the private sector has the capital and technical expertise to build new infrastructure and ensure traffic prioritisation in crisis scenarios. However, on the other, their incentive structures are not designed to account for national security threats.

Private actors like Meta have developed internal systems to tag and prioritise traffic, ensuring critical services like WhatsApp remain operational during emergencies. However, the industry lacks standardised protocols for national-scale prioritisation—especially for defence, intelligence, and financial traffic. In the absence of regulation, some such questions linger: Should private companies be entrusted with safeguarding military-grade data during a crisis? Who determines which data takes precedence when capacity is constrained?

India's Dilemma: Strategic Investment, Systemic Inertia

India faces a dual challenge. It must rapidly diversify its cable landings while also reforming the regulatory ecosystem that deters investment. Currently, international players see India as a difficult cable landing destination. Unlike Singapore, which has become a cable hub through streamlined regulations and investor-friendly policy, India's opaque permit regime and lawful intercept requirements have raised costs and slowed down projects.

If India is to emerge as a digital powerhouse, it must reorient its policy from restriction to facilitation. A shift in landings away from Mumbai and Chennai toward more geographically dispersed ports—in Gujarat, Lakshadweep, or the Andaman and Nicobar Islands—would bolster resiliency. But this also demands significant investment in complementary infrastructure such as data centres, terrestrial backhaul, and port security.

There are promising signs. Regulatory authorities are exploring the creation of an Indian-flagged cable repair entity. Partnerships with the Indian Navy, especially given its growing undersea capabilities and dynamic positioning ships, could offer a dual-use solution: rapid repair in peacetime, strategic autonomy in conflict.

Space Is Not the Answer (Yet)

The advent of low-Earth orbit (LEO) satellite constellations like Starlink and OneWeb has raised hopes of a wireless future. While these systems offer low-latency alternatives for niche applications, their bandwidth limitations—measured in gigabits versus the terabit-scale capacity of submarine cables—make them unsuitable as replacements.

They are, however, valuable as a redundancy layer. In the event of a localised outage or disaster, LEO networks can maintain essential services, support military command and control, and provide short-term continuity. But for long-term systemic resilience, physical cables remain indispensable.

Toward a Strategic Framework

The time for ad hoc approaches is over. What is needed is a strategic framework that addresses three core imperatives:

1. Redundancy and Diversification: National infrastructure plans must mandate cable route diversity, enforce geographic dispersion of landing stations, and incentivize operators to invest in alternate pathways.

2. Regulatory Modernisation: Permit finalisation timelines must be reduced through digitisation, single-window clearances, and bilateral pre-clearance mechanisms. A regional repair coordination centre—perhaps under the auspices of Quad—could provide rapid response capacity.

3. Multilateral Governance: Current treaties are inadequate. Forums like the Quad, Indo-Pacific Economic Framework, and International Telecommunication Union must elevate submarine cable security as a critical agenda item. A binding,

multilateral protocol on cable repair, data prioritisation, and attribution for sabotage is urgently needed.

A Strategic Imperative beneath the Surface

In the contest for digital dominance, cables are not just infrastructure—they are weapons, chokepoints, and vulnerabilities. They are conduits for economic activity, military coordination, and political messaging. And yet, for all their importance, they remain submerged in both the literal and policy sense.

As geopolitical tensions mount, the resilience of submarine cable networks may well determine a nation's ability to project power, preserve sovereignty, and safeguard prosperity. India, the United States, and their partners have an opportunity—and an obligation—to ensure that these arteries of modern life remain safe, secure, and submerged.

Connectivity, Competition, and Corridors: From Quad to IMEC

In recent years, the geostrategic landscape across the Indian Ocean Region and beyond has witnessed a series of quietly revolutionary shifts. Connectivity, once viewed as the realm of infrastructure and trade, is now a critical axis of geopolitical alignment. From plurilateral coalitions like the Quad and I2U2 to ambitious infrastructural visions such as the India-Middle East-Europe Economic Corridor (IMEC), these efforts reflect an evolving and increasingly intricate pattern of cooperation. At the heart of these initiatives lies an attempt to forge resilient links between nations, hedge against regional instability, and shape the strategic contours of the Indo-Pacific and its peripheries.

Maritime Security: The Western Indian Ocean as Strategic Frontline

The Indian Navy has emerged as a linchpin in efforts to stabilise and secure the Western Indian Ocean, a region under continuous threat from piracy, narcotics trafficking and, now, long-range missile and drone attacks. Central to India's naval strategy is the expansion of Maritime Domain Awareness (MDA), operationalised through a network of surveillance assets, bilateral information exchange agreements with 25 countries, and the Gurgaon-based Information Fusion Centre for the Indian Ocean Region (IFC-IOR), which collaborates with 75 international entities.

Operationally, the Navy's mission-based deployments (MBDs) have tackled threats ranging from piracy to drone warfare. Since 2008, Indian deployments in the Gulf of Aden have resulted in the safe escort of nearly 4,000 vessels and over 27,000 seafarers, neutralisation of 45 incidents of piracy, and the capture of 120 pirates. These operations have intensified since late 2023 by now addressing aerial and missile threats under Operation Sankalp.

The Indian Navy has also demonstrated versatility through Humanitarian Assistance and Disaster Relief (HADR) operations, non-combatant evacuations (notably rescuing over 6,000 individuals in the past decade), and narcotics interdictions, including seizures of over 7,500 kg in the past year. These operations rest on a framework of cooperative maritime security, bolstered by initiatives like SAGAR and its expanded version, MAHASAGAR, which have broadened India's security engagement from the Indian Ocean to the Pacific.

India's maritime diplomacy is underscored by coordinated patrols, logistical agreements, and multilateral forums such as the Indian Ocean Naval Symposium (IONS), currently comprising 25 member states. Institutionalised exercises, staff talks, and capacity-building efforts with smaller navies deepen regional integration.

IMEC and India's Expanding Maritime Ambitions

The India-Middle East-Europe Economic Corridor (IMEC) represents a transformative vision in the domain of connectivity. Positioned as an alternative to geopolitically volatile corridors, it seeks to link India, the Middle East, and Europe through multimodal infrastructure spanning sea and land.

India has already operationalised the first maritime leg of IMEC with the United Arab Emirates (UAE) via an intergovernmental framework agreement. A pilot project, My3, aims to establish a virtual trade corridor between select Indian and Emirati ports. By aligning regulatory standards, digitising customs and immigration procedures, and instituting a green shipping channel, the project aims to reduce

transit time and cost by 40% and 30%, respectively.

The vision extends beyond bilateralism. Stakeholder engagement with France, Israel, and others highlights the Corridor's multilateral scope. Yet challenges abound: divergent regulatory frameworks, infrastructure gaps, and geopolitical frictions, particularly along the 3,000-kilometre UAE-Haifa land leg, which includes border chokepoints between UAE, Saudi Arabia, Jordan, and Israel.

Rail infrastructure, critical for scale and cost-efficiency, remains a weak link, particularly in Saudi Arabia. Estimates suggest building this would require $20 billion. Intermittent border closures, customs delays, and political sensitivities—notably Saudi caution about cargo destined for Israel—further complicate logistics. Still, the time and cost advantages over traditional sea routes are evident: land transit from UAE to Haifa could reduce delivery from 14 days by sea to four by land.

Private Sector as Catalyst

Private logistics firms are spearheading initiatives to modernise and digitise connectivity frameworks. Innovations such as port community systems and logistics dashboards enhance visibility and synchronisation. A critical breakthrough is the implementation of pre-cleared cargo, enabling consignees to bypass re-inspection, reducing delays and transaction costs.

Moreover, by providing risk guarantees and leveraging trade finance solutions, logistics operators are helping micro, small and medium enterprises (MSMEs) access overseas markets at reduced interest rates. Initiatives like Bharat Mart in Dubai, which showcases products from 1,500-2,000 Indian MSMEs, amplify market access across Gulf Cooperation Council (GCC) and African markets. Such platforms harness Dubai's traditional role as a re-export hub to re-anchor historical trade networks.

Yet, scalability hinges on resolving financing gaps. The estimated $60-70 billion investment required for the full UAE-Haifa link necessitates public-private partnerships (PPPs) backed by Development Finance Institutions (DFIs), political risk insurance, and low-interest loans. The US International Development Finance Corporation (IDFC) is well-positioned to underwrite such investments, provided projects exclude Chinese hardware and tech components.

Multilateral Frameworks: The Promise and Limits of the Quad

On the eastern flank, the Quad—comprising the US, India, Japan, and Australia—remains a pivotal yet under-optimised mechanism. Since its reconstitution in 2019-2020 and elevation to leader-level summits under the Biden administration, the Quad has developed a broad agenda: vaccines, infrastructure, clean energy, cyber, and maritime cooperation. However, this breadth has made it unwieldy.

There is now a consensus on the need to streamline priorities. Three domains stand out: maritime security, cyber cooperation, and space. The Indo-Pacific Maritime Domain Awareness (IPMDA) initiative has shown promise in fusing satellite-derived intelligence for regional partners, yet remains limited in scale. Greater collaboration on Intelligence, Surveillance, and Reconnaissance, leveraging P-8 aircraft, MQ-9 drones, and high-altitude platforms could create a regional ISR network. Similarly, undersea surveillance and protection of submarine cables offer a logical next step.

In the cyber space, Quad members must deepen cooperation through AI-powered threat detection and develop multilateral platforms for information sharing. Space cooperation, too, has immense potential. With all four investing in Low-Earth Orbit (LEO) capabilities and dual-use satellite technologies, areas like space situational awareness, civil-military integration, and domain awareness beckon.

IMEC, I2U2, and Strategic Minilateralism

Parallel initiatives like I2U2 (India, Israel, UAE, and the US) reflect the trend towards flexible, goal-oriented coalitions. I2U2, though hamstrung by the Gaza conflict shortly after its launch, holds potential for investment in energy, food security, and technology. Its success depends on high-level political attention and responsive bureaucratic coordination.

IMEC and I2U2, if executed well, can be cloned across regions. The modularity of these constructs allows adaptation—a Saudi-focused I2U2 post-normalisation, or a Southeast Asia variant with Singapore or Indonesia. The US's preference for compact, and results-driven minilateralism over expansive multilateral structures like Indian Ocean Rim Association (IORA) aligns well with this approach.

US-India Strategic Convergence

The US-India defence relationship, particularly at the naval level, is steadily maturing. India now conducts more joint military exercises with the US than with any other country. From Malabar to tri-service amphibious drills, interoperability has reached unprecedented levels. Foundational agreements such as COMCASA, LEMOA (Logistics Exchange Memorandum of Agreement, a military agreement between India and the US that establishes the terms for reciprocal provision of logistics support, supplies, and services), and the Master Ship Repair Agreement enable real-time communication, logistics sharing, and mutual servicing.

Indian naval support during recent Red Sea crises—such as the rescue of the Marlin Rwanda, where 29 Indian naval fire fighters saved the ship from abandonment due to Houthi missile strikes—demonstrates both capability and commitment. India's anti-narcotics and counter-piracy operations, sometimes conducted under the UN Convention on the Law of the Sea (UNCLOS), sometimes in coordination with the Combined Maritime Forces, reinforce its proactive regional role.

Lessons from the Red Sea and Forward Challenges

The current Red Sea crisis has exposed the asymmetry in maritime threats. $5,000 drones are being countered with $1.8 million missiles, draining stockpiles originally intended for China contingencies. Directed energy weapons, particularly lasers, have emerged as a cost-effective alternative that merit urgent investment.

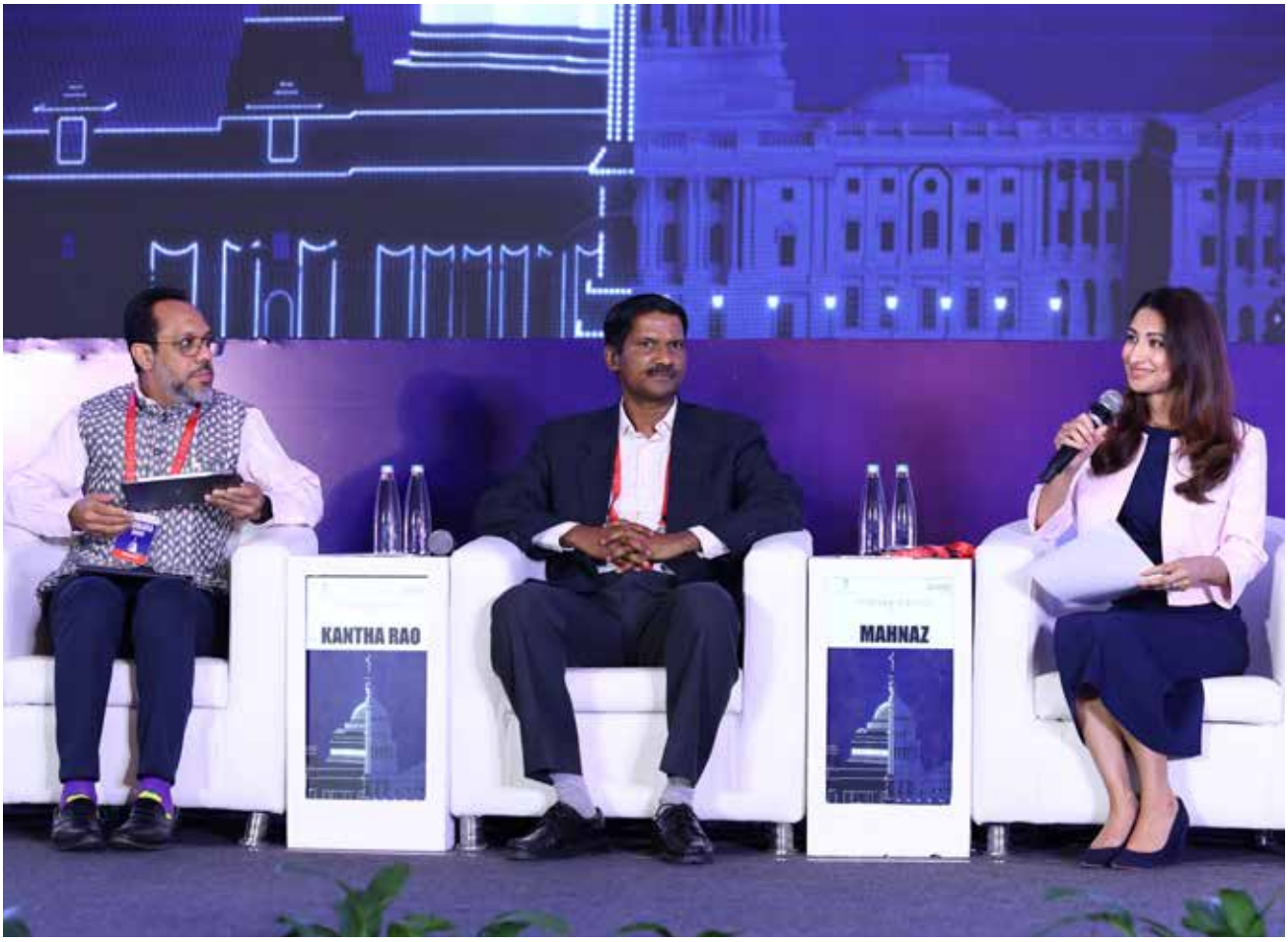
The integration of air defences during Iran's missile attack on Israel in April 2024 where Jordanian, UK, US, and Israeli assets acted in concert, offers a model of real-time data fusion and coordinated response that the Quad could emulate. Moreover, maritime security now involves contending with semi-conventional threats like unmanned platforms, necessitating a re-imagined framework of cooperation that balances national mandates with shared interests.

India's experience shows that coordination can proceed even without full formal cooperation. Informal information exchange networks have sometimes proven more effective than secure ones. But the imperative remains: build real-time data exchange, establish interoperability, and prepare standard operating procedures across contingencies.

Toward Resilient Connectivity

The success of IMEC and similar ventures hinges on three factors: trust among stakeholders, bankable infrastructure projects, and integrated logistics operators capable of end-to-end delivery. Connectivity is no longer merely about building roads or shipping lanes; it is a strategic endeavour that binds economies, cultures, and security architectures.

As geopolitical fault lines harden and regional challenges proliferate, India and its partners are charting new corridors, not just physical, but political and technological. Whether in the Indo-Pacific or across Eurasia, the real question is not whether such connectivity can be built, but whether it can endure. The answer lies in partnerships that are flexible, resilient, and above all, rooted in shared purpose.


KANTHA RAO
MAHNAZ


VISHWESH

Reimagining Trade, Innovation, and Workforce between India and the US

As global power balances shift and the era of hyper-globalisation retreats into a more fragmented world order, India and the United States (US) are deepening a partnership that transcends traditional economic diplomacy. At stake is not merely the volume of bilateral trade or the distribution of technology supply chains but a fundamental reordering of how strategic alignment, economic resilience, and democratic values shape global systems.

This chapter explores the depth and direction of the trilateral intersection between trade policy, innovation ecosystems, and human capital mobility, based on the deliberations from three comprehensive sessions involving stakeholders from government, industry, and policy.

Toward a New Trade Architecture

India's trade policy is undergoing a paradigmatic shift, one that seeks to decouple growth ambitions from dependency on unpredictable global markets and instead embed itself in value-based trade with trusted partners. At the core of this realignment is a recognition that traditional multilateral frameworks such as the World Trade Organization (WTO) have failed to check the disruptive consequences of non-market economies, particularly China. The resulting distortions ranging from dumped substandard goods to hidden subsidies and opaque compliance regimes have prompted India to restructure its bilateral and regional trade strategy.

Strategic Orientation and Partner Selection

India has chosen to pivot decisively toward trade engagement with developed, rule-abiding economies. This has been evident in the accelerated conclusion of Free Trade Agreements (FTAs) with countries and blocs such as the United Arab Emirates (UAE), Australia, and European Free Trade Association (EFTA, comprising Switzerland, Norway, Iceland, and Liechtenstein). These agreements reflect a deliberate departure from trade entanglements with partners lacking regulatory transparency or fair market practices.

India's exit from the Regional Comprehensive Economic Partnership (RCEP) was emblematic of this repositioning. Despite initiating RCEP negotiations in 2014, India ultimately withdrew on grounds that the agreement, in effect, would amount to a de facto FTA with China—a non-market economy with systemic advantages incompatible with India's manufacturing base. Given the absence of any structural protections for smallholder farmers, micro-enterprises, and unorganised labour, the risks of RCEP far outweighed its benefits.

This strategic selectivity does not imply isolationism. Rather, it reflects a principle-based engagement strategy, emphasizing transparency, reciprocity, and resilience over numerical trade expansion alone.

Reshaping Agreements: Equity and Innovation

Recent FTAs have incorporated structural features designed to ensure equitable outcomes. The EFTA agreement, for instance, introduces a $100 billion foreign direct investment (FDI) commitment linked to the creation of one million direct jobs in India, with a claw back clause for non-compliance—marking a first-of-its-kind integration of investment and employment into a trade treaty under WTO norms.

This innovation recognises the need for embedding development goals within the legal architecture of trade. It also establishes precedents for future

negotiations, particularly with countries where historical trade deficits or competitive asymmetries exist.

Moreover, India's approach emphasizes a two-list framework in negotiations: offensive interests (such as technology imports, energy access, and high-end machinery) and defensive interests (such as agriculture, small-scale industries, and micro, small and medium enterprises [MSMEs]). Fairness is pursued not through rigid protectionism but through recognition of structural sensitivities and calibrated concessions.

India–US Bilateral Trade Agreement

The ongoing negotiations for a Bilateral Trade Agreement (BTA) between India and the US represent a pivotal chapter in the two countries' economic partnership. Unlike past dialogues which happened in fits and starts, the current negotiation cycle is marked by strategic alignment, political will, and a sense of urgency shaped by both economic pragmatism and geopolitical necessity.

The momentum toward a comprehensive BTA began following a high-level political commitment to expand bilateral trade to $500 billion. This goal, articulated during past presidential and prime ministerial summits, set the groundwork for deeper engagement. While preliminary discussions had occurred during earlier administrations, the current phase of negotiation reflects a level of continuity, maturity, and institutionalisation not previously seen.

In early 2025, India and the US finalised a set of Terms of Reference (TORs) to govern the structure and scope of negotiations. These TORs provide a framework for addressing a wide array of trade-related issues—tariffs, non-tariff barriers, services liberalisation, digital trade, intellectual property rights, rules of origin, and investment facilitation. Multiple rounds of bilateral talks have followed, including working group-level discussions and leadership dialogues in both capitals.

The round of formal negotiations involved Indian trade officials travelling to Washington for three days of structured meetings. These discussions reflect a methodical, iterative approach rather than an all-or-nothing strategy. There is broad consensus that all options remain open, including a phased deal, early harvest agreement, or a single comprehensive package. The overriding principle is to ensure speed without sacrificing balance, and ensure comprehensiveness without compromising sensitivity.

While the specifics of the BTA remain under wraps, several high-priority themes are known to be part of the negotiation agenda:

- Tariff Rationalisation: India has long maintained higher tariffs on several categories of goods relative to the US average. However, most of these have not been contentious given that the bulk of such measures are directed at economies practicing unfair trade. Discussions here are expected to focus more on reciprocity and market access than on punitive adjustments.
- Digital Trade and Data Sovereignty: With the rapid expansion of India's digital economy and the US's leadership in technology services and platforms, digital trade has emerged as a critical area. Negotiators are reportedly exploring frameworks that protect India's data sovereignty while enabling American firms to operate transparently and competitively in the Indian digital market.
- Services and Professional Mobility: India's comparative advantage in IT, engineering, and professional services has made access to services a core element of the BTA. Both countries are examining mechanisms for easing visa regimes, improving talent mobility, and recognising sector-specific credentials, particularly in IT and health care.
- Investment and Intellectual Property: The BTA is expected to address concerns related to regulatory stability, IP enforcement, and dispute resolution—areas critical to long-term investment flows. India's transparent legal framework, absence of hidden subsidies, and commitment to WTO-compliant practices has helped to strengthen its case as a reliable investment destination.
- Critical Supply Chains and Strategic Sectors: There is a parallel effort to use the BTA as a vehicle to de-risk critical supply chains—in semiconductors, rare earth minerals, defence production, and clean technology. This involves trust-based cooperation, including rules-of-origin agreements that prevent indirect or third-country exploitation of preferential trade access.

The BTA negotiations are unfolding in a delicate global environment marked by protectionist

backlashes, re-shoring initiatives, and redefined strategic alliances. However, India and the US have approached the deal as natural allies—both economically and geopolitically. Unlike trade talks with adversarial or competitive economies, this negotiation is built on mutual strategic interest, shared democratic frameworks, and converging views on Indo-Pacific stability and supply chain resilience.

Importantly, both sides have consciously de-risked the talks from past points of friction, including retaliatory tariffs and trade remedy actions. The emphasis now lies on constructing a forward-looking framework that reflects 21st-century trade realities, including digital commerce, climate-sensitive supply chains, and ethical labour practices.

The presence of enforcement provisions, investment incentives, and value chain localisation strategies may also make this BTA a template for future US agreements in the Global South. For India, the BTA serves as an entry point into the high-value segments of the American market and offers a credible pathway to elevate its status in global trade hierarchies.

With successive rounds of discussions progressing constructively, expectations for a breakthrough—whether as a full agreement or phased implementation—are growing. Unlike in previous attempts where political transitions and domestic constraints stalled the momentum, the current BTA negotiation benefits from bipartisan interest in both capitals.

For India, the BTA is not just about market access but about formalising its identity as a trusted, rules-based, innovation-driven trading partner. For the United States, it provides a framework to deepen strategic ties in the Indo-Pacific, secure resilient supply chains, and gain a competitive ally in the emerging economic world order.

Innovation Ecosystems: From Delivery to Design

Trade policy may define the channels of commerce but innovation determines the trajectory of competitiveness. In the rebalanced post-globalisation world, innovation is not just about discovery but also about ecosystem architecture—how countries integrate talent, capital, data, and production into coherent systems that can compete globally.

India, long known as a services powerhouse, is now being courted as a manufacturing and design hub. The combination of the scale of its domestic market, availability of talent, digital infrastructure, and political commitment has begun to tip the scales in favour of deeper industrial and technological integration with the West.

Supply Chain Realignment and India's Manufacturing Leap

For multinational corporations, the logic of supply chain realignment has evolved from efficiency to resilience. Brands like Nike, which have historically followed a geography-shifting production model (from Japan and Korea to China, then Vietnam and Indonesia), are now investing heavily in India. Tamil Nadu has emerged as a critical node in global footwear production, positioning India among Nike's top five manufacturing destinations—with potential to enter the top three.

The shift is driven not only by cost arbitrage but also by governance. India's state and central governments are actively facilitating industry with red carpet treatment, simplified compliance procedures, and policy-level engagement. Yet systemic improvements are still needed—particularly in logistics, component sourcing, and petrochemical input manufacturing—to deepen India's integration into global supply chains.

Sourcing Power and Infrastructure Bottlenecks

Walmart's India strategy reflects a multi-layered commitment. The company operates Flipkart, India's largest e-commerce platform, as well as PhonePe, a leader in digital payments. In sourcing, Walmart aims to export over $10 billion in Indian goods annually by 2027. However, suppliers cite three critical bottlenecks:

- Infrastructure, especially ports and transportation
- Accessibility of incentives (PLI schemes, tax credits)
- Delays in customs, licensing, and quality approvals

Logistics costs in India remain 50–60% higher than in competitor nations, reducing global competitiveness. While infrastructure investments have begun to yield results, faster digitisation of public services and export-related documentation remains essential. Transparency, predictability, and time compression are as important as tax rebates or subsidies.

Semiconductor Design and India's R&D Maturity

India's innovation narrative is perhaps most advanced in semiconductors. AMD's operations in India—built over two decades—have evolved from staffing support to end-to-end product design. Every stage of chip development, short of manufacturing, is now handled in India, with zero HQ intervention.

This evolution reflects not only a maturing engineering workforce but also rising institutional trust. India's design teams now handle programme and project management, verification, digital implementation, and integration—effectively acting as a parallel HQ for advanced microprocessor innovation.

The domestic semiconductor ecosystem is also gaining momentum. With Micron establishing packaging units and Tata venturing into foundry and outsourced semiconductor assembly and test (OSAT) operations, India is laying the groundwork for full-stack participation. Investment in design centres, talent pools, and government-backed capital schemes will be necessary to bridge the final mile to fabrication.

AI and the Reordering of Innovation

Artificial intelligence, the defining general-purpose technology of the decade, is emerging as a critical battleground. Indian innovation is well-positioned in terms of software development and deployment, but risks falling behind in frontier model training, domain-specific datasets, and semiconductor access.

The dichotomy between proprietary and open-source AI systems introduces further complexities. While US tech giants build walled models trained on curated data, India's strength lies in building open frameworks, especially for public service applications. The democratisation of AI in education, agriculture, and healthcare offers a new pathway: not merely adopting global models, but training India-specific large language models (LLMs) grounded in native data.

Already, platforms like Sarvam and Krutrim are working on Indic language models, while the government is moving to open anonymised digital public infrastructure data for use in AI applications. India's role in shaping AI ethics, inclusion frameworks, and equitable access to computing power will be vital in framing innovation as a developmental, not just commercial, force.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Migration and Mobility: Building a Strategic Talent Corridor

Human capital has emerged as a decisive factor in global geopolitics—not just as an economic asset but as a tool of foreign policy, national security, and innovation leadership. For India and the United States (US), mobility of talent is no longer a peripheral concern—it is central to their strategic calculus.

India stands at a demographic peak with a labour force that grows by over 10 million annually, while advanced economies confront aging populations, labour shortfalls, and a mismatch between industrial requirements and available skills. This demographic asymmetry creates the possibility for a structured, mutually beneficial framework of labour mobility. However, realising this potential requires addressing systemic constraints, ideological hurdles, and policy misalignments on both sides.

Demographics and Geopolitical Leverage

India currently receives over $120 billion in annual remittances—more than any other country—primarily from the Gulf Cooperation Council (GCC) countries. However, this migration has been dominated by low-wage labour under circular, non-resident arrangements. The real opportunity lies in scaling this model to more productive, better-paying geographies such as East Asia, Europe, and North America.

The Organization for Economic Co-operation and Development (OECD) economies are projected to face a combined shortage of over 50 million workers by 2030. This shortage cuts across sectors: elder care in Japan, truck driving in Germany, agricultural harvesting in Spain, and skilled construction across the European Union (EU). At the same time, India's comparative advantage is growing not only in raw population but also in sector-specific human capital—from English-speaking engineers to nurses trained in evidence-based protocols.

This alignment is creating a window for India to institutionalise migration as a diplomatic and economic tool—anchored in bilateral agreements, harmonised skill frameworks, and strong overseas welfare mechanisms.

A Shift from Migration to Mobility

Traditional views of migration—especially in the West—have tied it to permanent residency and pathways to citizenship. This model increasingly clashes with political resistance in many host countries. India, instead, is proposing a shift toward "mobility" rather than "migration": temporary, circular, skills-based movement with structured entry and exit.

This model already works in the GCC, where India holds over 35% market share in foreign labour. It is now being expanded to Japan and South Korea, both of which operate guest-worker visa systems without provisions for citizenship. Countries like Germany and Poland are also showing interest in structured mobility schemes, particularly for mid-skill sectors.

Such a framework allows India to position itself not just as a supplier of talent but as a responsible partner offering scalable, transparent, and legally compliant workforce pipelines. It also allows host countries to de-risk political backlash by distinguishing temporary economic mobility from permanent immigration.

Systemic Challenges in India's Migration Ecosystem

Despite this possible opportunity, India's migration ecosystem faces significant limitations. The key challenges include:

- Credential Incompatibility: Many Indian degrees and certifications are not recognised internationally due to lack of harmonisation.
- Language Barriers: Japanese, Korean, and some European markets require language fluency, which is rarely built into Indian vocational programmes.
- Financial Constraints: The cost of skill training and international placement, often $8,000–10,000 per worker, is prohibitive for low-income aspirants.
- Regulatory Gaps: The current framework is decentralised and reactive, with minimal standardisation across state and central policies.
- Poor Intermediation: Many migrant placements are conducted by small, informal agencies, raising concerns around worker exploitation, misinformation, and lack of grievance redressal.

Some Indian states, like Kerala, have made significant progress with entities like NORKA (Non-Resident Keralites Affairs) which offer pre-departure training, language support, and welfare linkages. However, most states lack institutional capacity or incentives to develop migration pathways as economic strategy.

Lessons from Global Leaders: The Philippines Model

The Philippines offers a template for strategic labour mobility. With over 65 government-to-government (G2G) labour agreements, a dedicated Department for Migrant Workers, and strong support mechanisms for skill certification and placement, the Philippines has turned overseas employment into a national export strategy.

Their system incorporates:

- Harmonised training programmes aligned with foreign market needs
- Accredited training and placement agencies under a regulatory framework
- Government-backed credit schemes for workers to finance training and migration
- Bilateral labour mobility compacts that specify wage protections, working conditions, and grievance mechanisms.

India, with its scale and capabilities, has the potential to replicate and exceed this model—provided it constructs a coordinating framework that includes both the central government (for diplomacy, standardisation, and bilateral agreements) and state governments (for mobilising talent pools and delivering training).

Framework for Strategic Mobility

To fully operationalise migration as a tool of diplomacy and economic growth, India needs to pursue a comprehensive strategy with the following components:

1. **Bilateral Mobility Agreements:** India must prioritise signing labour mobility compacts that clarify visa categories, duration of stay, rights, and responsibilities.
2. **Skill Harmonisation:** Indian vocational education must align with international frameworks such as the European Qualifications Framework (EQF) or Japan's Technical Intern Training Program (TITP).
3. **Language and Cultural Training:** Skilling must include intensive language instruction, especially for non-English markets, and pre-departure cultural orientation.
4. **Financing Instruments:** Credit guarantees or subsidised loans must be provided to candidates who cannot afford the up-front cost of skilling and migration.
5. **Regulatory Reform:** The intermediation industry for migration must be formalised with standardised contracts, licensing requirements, and grievance redressal mechanisms.
6. **Public–Private Partnerships:** Staffing firms, industry associations, and chambers of commerce should be brought into a collaborative framework for scaling placements.

A migration development body, even if not a new ministry, must be created to coordinate these efforts. This entity should act as the nodal agency interfacing with international labour departments, training institutes, and Indian diplomatic missions abroad.

3.6 AI, Automation, and the Future of Work

While migration presents an enormous opportunity, it must also navigate the emerging disruptions caused by artificial intelligence and automation. In sectors like software development, accounting, and technical writing, generative AI is already displacing traditional roles or dramatically compressing hiring cycles.

However, many of the core migration sectors remain relatively insulated in the short-to-medium term:

- Care work, especially elder care, retains high emotional and physical labour demands
- Construction and logistics require physical presence and context-specific decision-making
- Agriculture, especially harvesting and seasonal labour, remains labour-intensive despite growing mechanisation
- Retail and hospitality, particularly night shifts and customer interaction roles, continue to demand human engagement.

Mid-skill workers in industrial jobs, factory roles, and logistics will likely see AI as a productivity enhancer rather than a job destroyer, at least over the next decade. The real vulnerability lies in commoditised service roles that rely on repetitive digital inputs, precisely where many Global Capability Centres (GCCs) operate today.

Thus, India's migration policy must include an AI-readiness component, training candidates in new tools, upskilling workers displaced by automation and embedding human-machine collaboration into vocational programmes.

Aligning the Three Arcs

India–US relations now extend across three deeply interconnected arcs: trade, innovation, and talent mobility. The structural redesign of bilateral trade policy reflects a maturing power ready to demand fairness in global exchanges. The ascent of India as an innovation and manufacturing hub reveals an ecosystem seeking to graduate from delivery to design. And the recalibration of migration policy illustrates a transition from demographic pressure to strategic leverage.

These are not standalone developments. They are reinforcing vectors in a broader shift toward a multipolar, rules-based, values-aligned global order—one that both India and the US can shape not merely as economic partners but as co-architects.

At the heart of this convergence is a simple truth: in a fractured world, trust is not a luxury, it is infrastructure. And trust, once earned and institutionalised, is the most scalable asset in global diplomacy.


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Health and Wellness in the Age of Convergence

Contemporary advancements in medicine have successfully extended lifespan by 10–12 years across many geographies. However, this longevity has paradoxically translated into more years lived with disease. The concept of health span, defined as the duration of life spent in relatively disease-free conditions, has remained stagnant at around 50–55 years in many Western nations. The final decade of life often involves escalating multimorbidity, placing severe burdens on healthcare systems. In the United States (US), this has contributed to healthcare expenditures constituting 17% of GDP.

Scientific Wellness: The New Frontier

The emergence of geroscience, the study of aging processes before the onset of disease, has reframed how longevity is approached. By integrating multi-omic biomarkers, including proteins, metabolites, and genetic signals, scientists can now predict the likelihood of developing chronic illnesses like cardiovascular disease, cancer, and diabetes well before symptoms manifest. This new paradigm, known as scientific wellness, promises a shift from generalised preventive care to actionable, personalised interventions.

Notably, this approach is not reliant on miracle supplements or singular treatments. Instead, it requires a systems biology framework—echoing the holistic philosophies embedded in traditional Eastern systems like Ayurveda and Traditional Chinese Medicine (TCM). The fusion of Western mechanistic insights with Eastern therapeutic approaches marks a promising avenue for comprehensive health strategies.

AI and the Data Imperative

Artificial intelligence (AI) plays a catalytic role in realising this vision. Modern AI systems, particularly those leveraging multimodal data, are capable of interpreting diverse inputs: ECGs, MRIs, EEGs, radiology and pathology images, and bloodwork. This facilitates early diagnosis and precise treatment recommendations. In the US, where over 90% of health systems now utilise digitised medical records, AI is proving transformative, detecting patterns invisible to even trained clinicians.

Yet, India lags significantly behind. Only 2% of health systems are digitised, a stark contrast given that by 2047, over 20% of India's population, approximately 350 million people, will be over the age of 60. Combined with rising metabolic disorders among younger populations, India faces a future where 600–700 million adults may become economically unproductive unless systemic health reforms are adopted.

Data Localisation and Model Bias

The quality and applicability of AI models are inherently dependent on the underlying data. Models trained on Western populations may falter when applied to Indian cohorts due to differences in skin tones, metabolic profiles, and genetic markers. Data localisation is not merely a policy preference—it is a clinical necessity. The absence of indigenous datasets risks perpetuating diagnostic inaccuracies and treatment inefficiencies.

Two technological pathways offer promise: de-identification of data under Health Insurance Portability and Accountability Act (HIPAA)-equivalent standards, and federated learning models, which allow AI systems to be trained on

local datasets without centralising sensitive information. This approach has already gained traction globally including in Brazil, Israel, and Singapore.

Redefining the Healthcare Stack

To capitalise on these opportunities, India must leapfrog traditional healthcare models and construct a distinct health stack aligned with its digital public infrastructure (DPI). Unlike digital payments, health involves complex interactions, multiple stakeholders, and deeply ingrained behavioural patterns. Building an effective system requires:

- Cultural and Institutional Mindset Shift: Redefining care institutions to prioritise wellness and holistic care, supported by a new generation of AI-augmented health practitioners.
- Investment in Indigenous Data and AI: Developing AI tools trained on Indian data to personalise therapeutics, diagnostics, and wellness interventions.
- Affordable Wellness Products: Scaling non-pharmaceutical therapeutics and supplements grounded in Ayurveda and traditional knowledge to reach mass markets.

Currently, less than 2% of India's total healthcare expenditure is directed toward preventive wellness—a figure that must be urgently revised.

Consumer Evolution and Market Dynamics

Consumer preferences are also undergoing a seismic shift—from fast-moving consumer goods (FMCGs) to fast-moving wellness goods (FMWGs). In the US, grocery aisles dedicated to wellness products are commonplace, and the market is growing at 12–14% annually. Indian start-ups and exporters can capitalise on this momentum by providing Ayurvedic products, yoga regimens, and mindfulness platforms tailored to global wellness trends.

Importantly, Ayurveda's strength lies in its personalisation. Unlike Western medicine's standardised protocols, Ayurveda recognises individual variability based on genetic and energetic constitutions. With AI, this ancient principle can be modernised to create daily pulse-based diagnostics, personalised nutrition guides, and lifestyle recommendations powered by real-time biometric feedback.

Education and Systemic Inertia

A key bottleneck remains the medical education system which continues to sideline wellness and nutrition. In the US, premier institutions still do not incorporate these subjects into core curricula. Change will likely come from external economic forces—insurance models that reward preventive behaviour, new regulatory incentives, and the success of wellness-focused care providers.

Governments, too, have a role to play. Models like Singapore's offer a blueprint: incentivise wellness, penalise chronic neglect, and shift public expenditure from end-of-life care (which consumes up to 70% of total spend in some systems) to lifelong health maintenance.

Democratising Wellness

Affordability remains a challenge. While wellness products often carry a premium price tag, much of the traditional knowledge in India—such as turmeric concoctions or herbal remedies—comes at virtually no cost. The goal must be to create a tiered system that respects cultural wisdom while offering scientifically validated, scalable, and accessible solutions.

India stands at a pivotal juncture. It can emulate and localise the successes of countries like the US, but it must avoid replicating their pitfalls—especially the capital-intensive, hospital-centric, disease-reactive model. Instead, by integrating technology with tradition, data with empathy, and AI with Ayurveda, India and the US have an opportunity to pioneer a new global paradigm for health and longevity.

India's Nuclear Energy Capacity Expansion: The Role of Small Modular Reactors

India has set a goal of having an installed nuclear energy capacity of 100 gigawatts (GW) by 2047, a significant increase from the current installed base of approximately 8,800 megawatts (MW), and an additional 8,000 MW under construction. Expansion strategies rely on scaling up existing pressurised heavy water reactors (PHWRs), leveraging foreign-designed light water reactors, operationalising breeder reactor technology, and deploying new small modular reactors (SMRs) such as the Bharat Modular Reactor (BMR).

Global and Domestic Context

Worldwide, 440 nuclear reactors across 31 countries deliver approximately 10% of total electricity and constitute a quarter of all low-carbon electricity generation. India, by contrast, generates only 3% of its electricity from nuclear sources. Leading studies project a dramatic uptick in nuclear power's share of the energy mix, highlighting it as a necessary, reliable, and low-carbon solution for the entire power grid. Without nuclear power, total system costs for electricity are expected to more than double. At COP28, 22 countries collectively pledged to triple nuclear capacity by 2050, with India setting a more aggressive timeline for expansion.

Technology and Economics of Small Modular Reactors

The Bharat Small Reactor (BSR), based on a modularised, evolutionary approach to the proven 220 MW design, is positioned to reduce deployment risk and facilitate predictable, cost-effective scaling. The current legal frameworks under the Atomic Energy Act and the Civil Liability for Nuclear Damage Act (CLNDA) permit initial adoption, while full sectoral participation awaits further amendments.

- Capital expenditure is estimated at US$ 1.5 million per MW for these modular designs, with delivered electricity priced at 2–3 (3–4 cents) per kilowatt-hour (kWh), significantly less than price of electricity generated by hybrid solar-battery installations (12 cents per kWh).
- Comparable international SMR technologies are at an earlier stage, with capital costs ranging from US$ 10 to 20 million per MW.

Major Indian industrial conglomerates have signalled readiness to participate in the SMR ecosystem. Although private sector investment is possible within prescribed legal limits, comprehensive policy changes are required to enable full ownership, operations, and risk-sharing.

Enabling frameworks must prioritise resolution of outstanding liability and fuel assurance issues, as well as the creation of robust offtake and investment guarantees. Analogies to the aerospace sector highlight the need for balanced liability between operator and manufacturer, with standardised and modularised approaches driving economies of scale and faster project timelines.

International technology transfer is underway, with regulatory clearance from the US Department of Energy allowing non-critical nuclear technology to be transferred to select Indian partners. Up to 80% of SMR system fabrication is expected to take place domestically, supporting the Atmanirbhar Bharat vision for self-sufficiency.

Features of the planned reactor projects are:

- Design life spans of 80–120 years
- On-site spent fuel storage throughout operational life

- Minimal land requirements (as low as 30 acres for a 600 MW plant)
- Adaptability to water scarcity via air cooling solutions
- Opportunities for integration with renewable energy where feasible

Historical data from building of Indian reactor indicates that in the absence of external delays (such as public resistance or permission barriers), PHWR projects can be completed in as little as five years. Reducing building time is critical: every three-year reduction in project delivery can yield an 8% savings in the levelised cost of electricity. Standardisation, procedural streamlining, and established site development are essential for maintaining aggressive timelines and driving costs down.

India's transition to clean energy—across nuclear, hydrogen, mobility, and renewables—demands simultaneous mobilisation of US$150–200 billion in capital for nuclear projects alone, through and beyond 2030. This challenge exceeds the historical exposure of the country's banking system to power infrastructure and underscores the need for strengthened secondary debt markets, stable power offtake agreements, and broad financial risk mitigation tools.

Alignment of India's civil nuclear liability regime with international conventions hinges on clarifying the distinctions between supplier and operator liability. Democratic deliberations are ongoing to address contentious provisions and ensure a balance that attracts both foreign vendors and private domestic entities. The long-term net-zero energy scenario requires nuclear deployment (up to 230 GW by 2070) far surpassing even current targets, reinforcing the importance of these reforms.

Industry-wide consensus emphasizes aggressive standardisation, modularisation, and a supportive regulatory regime to enable rapid, efficient project delivery. Collaboration with global partners in manufacturing, research and development, training, and operations is integral to building a robust nuclear energy ecosystem. The resulting infrastructure will support sectors ranging from data centres and green hydrogen to industrial growth, contributing decisively to national energy security and economic resilience.


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India-US Cooperation on Critical Minerals: Strategic Initiatives and Challenges

Critical minerals are a focal point in India-US relations, underscored by recent policy engagements, including India's entry into the Mineral Security Partnership in 2023 and a memorandum of understanding between the Department of Commerce and Ministry of Mines. The strategic mineral recovery initiative signed during Prime Minister Modi's 2025 visit to the United States (US) establishes joint research and development collaboration on lithium, cobalt, and recycling technologies. Critical minerals have become a geopolitical focal point amid China's escalating export controls, including outright bans on germanium, gallium, antimony, and various rare earth elements targeted at the US and India.

Two main strategies underpin the bilateral cooperation: a bilateral trade agreement currently under negotiation and engagement through the Quad framework. While India and the US share challenges in building domestic mining and processing capabilities, allied partners like Australia and Japan provide complementary strengths in raw materials supply and processing technology, respectively. These multilayered agreements and partnerships aim to circumvent supply chain vulnerabilities accentuated by increasing Chinese export restrictions.

India's Critical Minerals Mission

- In January 2025, India launched the National Critical Mineral Mission (NCMM) with an investment of approximately US$4 billion (34,000 crore), equally funded by the government and private sectors. The mission has several core components:
- Incentivisation of enhanced exploration through innovations such as exploration licenses that reward companies for discovery of critical minerals with royalty payments over 50 years.
- Expansion of offshore mineral exploration with multiple auction blocks currently active.
- Acquisition of international assets to supplement domestic supply, with government-backed support for Indian companies investing abroad.
- Investment in beneficiation and processing technologies through joint R&D initiatives, including targeted partnerships with countries like Japan.
- Trade facilitation through zero duties on critical minerals and scrap to stimulate imports and recycling efforts.
- Promotion of urban mining via incentivised recycling policies, with expectations to increase recycling enterprises from seven to potentially 50–100 active units.

This mission adopts a whole-of-government and whole-of-country approach, coordinating efforts across more than a dozen ministries and multiple public-sector undertakings to secure critical mineral supplies comprehensively.

Strategic Propositions for India-US Cooperation

Critical minerals intersect with key pillars of India-US relations including energy, defence, technology, and mobility. Unlike conventional trade which focuses on market access, critical minerals trade emphasizes supply guarantees and shared risk, demanding innovative policy architectures beyond standard trade agreements. Establishing a bilateral or plurilateral India-US critical minerals consortium, involving both the government and

private sectors, is seen as a critical step to pool risk and foster transparency in supply chains.

Transparency frameworks akin to those by the International Energy Agency for oil and gas could provide real-time tracking supply of critical minerals and emerging risks, and enabling proactive policy responses. Stockpiling of critical minerals as a measure of strategic security is also advocated, given the long lead times and investment horizons necessary for developing mining and processing capabilities. Co-investment in technological development and capacity building remains a priority to scale processing technologies and develop skilled human capital.

Market Dynamics and Investment Incentives

India permits 100% foreign direct investment (FDI) in the mining sector, supported by novel incentives like direct funding for exploration costs under the exploration license scheme designed to attract global junior miners by enabling them to earn royalties from subsequent mining operations without upfront ownership. Interest from foreign companies is growing due to these enhanced policy frameworks and road shows conducted by Indian authorities.

Financial subsidies and support mechanisms are embedded in the NCMM to address the significant upfront capital and operational costs associated with exploration, processing, recycling, and stockpiling. Coordination with US tools including tariffs, the Forced Labor Prevention Act (to exclude minerals tied to forced labour), and export finance facilities (DFC, EXIM Bank) are pathways to build resilient and compliant non-Chinese supply chains.

Technological Development and Processing Capacity

India has launched Centres of Excellence dedicated to critical minerals with a committed budget of approximately 1,000 crore to advance processing, refining, and alloy making technologies and capacities. These centres focus on elevating pilot scale research to commercial viability, partly in collaboration with international partners, including joint R&D initiatives under the strategic mineral recovery initiative with the US and Japan.

Recent announcements from China to impose export controls on key processing technologies reinforce the urgency for India and the US to accelerate indigenous technology development and reduce dependence on foreign supply chains.

Emerging Frontiers: Seabed Mining and Regulatory Frameworks

India actively explores seabed deposits within its exclusive economic zone, covering approximately 70% of its land area, with 13 blocks recently put up for auction encompassing polymetallic nodules and other marine minerals. Regulatory frameworks align with stringent environmental clearances, multisectoral agency approvals, and comprehensive impact assessments to ensure sustainable extraction practices.

India's membership in the International Seabed Authority enables engagement in global governance of deep-sea mining, although international regulations for deep-sea exploitation are still evolving. The United States' non-membership status presents unique challenges for its participation in these regimes.

Considerations and Diversification

India and the United States both recognize the strategic imperative of diversifying critical minerals supply chains away from excessive Chinese dependence. While policy nuances vary, the shared priority is to enhance resilient, interdependent, and diversified sourcing consistent with broader national security and economic goals. The growing trend of China's export restrictions since 2011 underscores the necessity of building alternative supply networks.

Industry and government stakeholders acknowledge the lengthy timelines involved—often more than a decade—to build full-scale mining and processing capacities, requiring a balance between impatience to initiate projects and patience for their maturation. The formation of dedicated India-US policy forums, ongoing trade negotiations, and public-private roundtables collectively aim to sustain the momentum beyond episodic attention, fostering a durable framework for collaboration on critical minerals.


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India's Transition from Market to Maker – Building Global Supply Chains

India stands at a defining juncture in its economic trajectory, poised to transition from a primarily consumption-driven market to a global manufacturing hub and supplier to the world. This shift requires the creation of a comprehensive ecosystem that integrates Indian companies into global value chains (GVCs). While countries like China and Vietnam have already achieved remarkable success in establishing efficient, export-oriented manufacturing systems, India now faces both an opportunity and a challenge to replicate and adapt these models to its unique context.

This transition is occurring amid a complex geopolitical environment shaped by global trade realignments, tariff negotiations, and strategic shifts in supply chains. Building manufacturing competitiveness is therefore not just an economic imperative but also a strategic necessity.

Key Sectors

Electronics as a Strategic Industry

Electronics manufacturing is a cornerstone of modern industrial ecosystems, influencing multiple sectors from defence to consumer goods. India has made notable progress, with its electronics manufacturing base growing to US$ 130–140 billion. However, China's electronics base remains ten times larger, underscoring the scale of the challenge.

To bridge this gap, India must:

- Conduct granular, sector-specific studies to identify foundational industries for revival and future growth.
- Enhance ease of doing business (EODB) and ensure predictability in policies to attract and retain GVCs.
- Focus on eliminating systemic inefficiencies rather than relying solely on compensatory incentives like production-linked incentives (PLIs).

The next phase of growth should focus on deepening the value chain through expansion of components and sub-assembly manufacturing, building design capabilities, encouraging companies to grow design engineering teams and match global standards of quality and scale.

The sector also acts as a social catalyst, providing millions of individuals from rural areas with their first opportunities for stable, formal employment.

Semiconductors and Supply Chain Development

The post-pandemic era has highlighted the need for safe, secure, and diversified supply chains. India has taken significant steps to build indigenous capabilities in the semiconductor ecosystem:

- Talent Development: More than 20 universities now offer specialised semiconductor curricula. Around 2,600 students are being trained annually to support industry needs.
- Supplier Network: From zero indigenous suppliers last year, India now has 25 qualified small and medium enterprises capable of producing critical components and assemblies for wafer fabrication equipment.
- Global Partnerships: Collaborations with international companies to develop and export semiconductor components to global markets.

Despite these achievements, scaling up remains a major challenge. Many of these new suppliers are small firms lacking sufficient capital to meet the

global demand. Access to affordable financing is critical to overcoming this barrier.

India's semiconductor mission now includes five units under construction, with two expected to roll out the first "Made in India" chips within the year. The near-term focus is on mastering 28-nanometer production, followed by a move to more advanced nodes. The mission also emphasizes developing the entire ecosystem, from design to manufacturing, ensuring long-term self-reliance and global competitiveness.

Artificial Intelligence and Emerging Technologies

India's AI strategy is structured around three key pillars:

- Democratising Access: Ensuring AI technologies are accessible to the widest possible user base and not restricted to a few entities.
- Fostering Indigenous Innovation: Encouraging startups, researchers, and domestic companies to develop AI models that are free of systemic and cultural biases.
- Building Global Partnerships: Collaborating internationally to co-develop technologies and jointly address emerging challenges.

India is actively working on:

- Developing its own large language models (LLMs) and AI chips.
- Encouraging innovation through techno-legal solutions rather than heavy-handed regulation.
- Focusing on specific, problem-driven use cases in sectors such as agriculture, healthcare, and education.

This approach balances rapid innovation with safeguards against potential societal harms, keeping regulation light and innovation-centric.

India's Manufacturing Landscape and GVC Participation

India's current manufacturing sector is valued at approximately US$ 500 billion, accounting for less than 14% of GDP. In stark contrast, China's manufacturing output is around US$ 5 trillion, highlighting the significant gap India must bridge to become a major player in global manufacturing.

One of the primary reasons for this disparity is India's limited participation in high-value, technology-intensive manufacturing. Much of India's international trade has been concentrated in traditional industries. Globally, approximately 70% of all trade takes place within GVCs, but India's participation in these high-value GVC segments remains significantly below this threshold.

For India to expand its role in global manufacturing and generate large-scale employment, it must dramatically increase its GVC integration. This requires addressing systemic barriers while simultaneously leveraging sector-specific strengths.

The key sector-agnostic priorities include:

1. Infrastructure Development: Strengthening logistics, ports, highways, and industrial zones to reduce operational costs and improve connectivity.

2. Skilling: Expanding workforce training to meet the needs of advanced manufacturing industries.

3. Research and Development: Increasing R&D expenditure, currently just 0.7% of GDP compared to the global average of 2.5–3%, to drive innovation and technology leadership.

In addition to these broad measures, sector-specific strategies must be implemented to address unique challenges and opportunities in individual industries:

1. Electronics: Introduce short-term incentives to offset cost disadvantages, make long-term investments in design and R&D, and continuously improve tax and tariff frameworks alongside infrastructure upgrades.

2. Chemicals: Enhance port infrastructure and streamline complex regulatory processes, particularly environmental clearances, to reduce bottlenecks.

3. Automobiles: Prioritise investment in electric vehicles (EVs) and battery manufacturing to stay competitive during the industry's global transition.

4. Textiles: Address deficits in feed materials and develop technical textiles to improve value addition.

5. Pharmaceuticals: Scale up from 3% of global value despite 14% of volume, and expand beyond the current US$ 50 billion footprint.

Policy Alignment and Institutional Coordination

A coherent policy environment is required to transform India into a global manufacturing hub. The current tax, FDI, and industrial policies had been formulated at different times to serve different objectives. As a result, these policies often

fail to align with one another or with today's global supply chain imperatives.

For instance, trade policies emphasize competitiveness but lack explicit provisions for GVC participation. They do not fully account for the scale or complexity of global manufacturing ecosystems. FDI frameworks also remain cumbersome and often slow to respond to dynamic investment needs.

To address these gaps, an inter-ministerial mechanism is essential. The recently announced National Manufacturing Council will serve as a coordinating body to streamline decision-making across ministries; improve agility in both policy formulation and execution; and oversee monitoring and ensure alignment of objectives.

This body will address key operational challenges such as:

- Visa facilitation for skilled professionals and technical experts
- Simplification of customs procedures and reducing turnaround time at ports
- Streamlining FDI regulations to encourage greater foreign investment and technology inflows
- Resolving tax-related inefficiencies to enhance ease of doing business

By fostering synergy among policies and institutions, this mechanism aims to create a predictable and investor-friendly environment that supports rapid scaling of manufacturing capabilities.

To bring coherence and urgency to India's manufacturing ambitions, a National Manufacturing Mission is also under development. This mission-mode approach will structure efforts into three focus areas:

1. 70% – Sectoral Development: Concentrated efforts to address industry-specific challenges and opportunities

2. 20% – Non-Sectoral Enablers: Addressing cross-cutting issues like tariffs, ease of doing business, and regulatory reforms

3. 10% – Future-Ready Investments: Funding emerging industries and technologies to prepare for long-term opportunities

The mission will establish empowered institutional mechanisms to coordinate between central ministries, state governments, and industry stakeholders. Dedicated expert groups will be formed to manage sectoral and cross-sectoral priorities, ensuring that initiatives are both comprehensive and targeted.

Global Geopolitical and Trade Dynamics

The global supply chain landscape is undergoing profound shifts driven by geopolitical tensions, technological competition, and economic realignments. The US, after decades of offshoring its manufacturing base, is now seeking to rebuild domestic production capacity. The COVID-19 pandemic and the Ukraine war highlighted the vulnerabilities of over-reliance on external suppliers for essential goods, underscoring the strategic need for secure and resilient supply chains.

The US strategy includes using tariffs and trade measures to encourage industries to relocate or diversify away from China. The strategy also aims to focus on advanced, high-end manufacturing and build a multi-layered supply chain network to withstand geopolitical shocks.

India, with its large workforce, growing industrial base, and favourable geopolitical alignment, initially emerged as preferred partner. Tariff negotiations are currently underway. The Indian diaspora in the US, numbering around 5 million, plays a pivotal role in reinforcing these ties, contributing 6% of US GDP and influencing political, social, and business interactions.

As global supply chains fragment and regionalise, India must strategically position itself to capture emerging opportunities by offering competitive production capabilities, policy stability, and a skilled workforce.

India's journey from being a consumption-driven market to a global manufacturing leader is both complex and transformative. Success will depend on sector-specific strategies, coherent policies, and effective institutional coordination.

By leveraging its demographic advantages, expanding design and manufacturing capabilities, and aligning with global shifts in supply chains, India has a unique opportunity to position itself as a cornerstone of the new global manufacturing order. This transition will not only strengthen India's economic resilience but also solidify its role as a strategic partner in shaping the future of global trade and technology.


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AI at Scale: Strategy for Technology Leadership

India's artificial intelligence (AI) strategy is built around creating a complete and integrated ecosystem across seven core pillars: compute infrastructure, data accessibility, skilled workforce development, responsible AI guidelines, startup funding, application development, and the creation of indigenous foundation models. The India AI Mission is designed to position the country as a global leader in AI by leveraging these pillars to solve large-scale societal problems and drive economic transformation.

The mission reflects India's ambition to not only adopt AI technologies but to develop them indigenously, ensuring long-term strategic autonomy. By building a comprehensive framework that spans infrastructure, talent, and governance, India aims to establish itself as a key player in shaping the future of global AI development.

Major Industry Investments

Industry participation in India's AI ecosystem is expanding at an unprecedented scale:

- Amazon has announced a $100+ billion CapEx investment focused on AI infrastructure development in India
- Other hyperscalers have made similarly large commitments, indicating strong industry-wide confidence in India's potential
- LAM Research, with a 25-year presence in India, evolved from software R&D to comprehensive supply chain development, showcasing ecosystem maturity
- Semiconductor equipment suppliers have scaled from nil indigenous suppliers to 25 qualified companies, demonstrating rapid domestic growth
- The global semiconductor market, projected to reach $1 trillion by 2030, will require immense infrastructure investments, underscoring the urgency of India's development efforts

The government's expectations for the India AI Mission were far exceeded. Anticipating only five or six proposals for large language models (LLMs), it received over 240 proposals, including a wide range of industry-specific small language models. This overwhelming response highlights India's domestic capabilities and ambition, while also signalling the scale of compute infrastructure required to implement these proposals effectively.

AI's transformative potential, particularly in natural language processing and generative AI, is vast. India's linguistic diversity and demographic complexity demand AI solutions that can enhance productivity for rural communities, small businesses, and individual entrepreneurs. Successful implementation could lead to dramatic improvements in per capita income and overall generation of business revenue.

The scale of investment required is immense. Major technology companies have already announced over $100 billion annually in capital expenditure for AI infrastructure globally. This reflects both industry confidence in AI's transformative potential and the magnitude of resources needed to build systems capable of solving citizen-scale problems.

Semiconductor Dependencies and Supply Chain Challenges

Current constraints in the supply of semiconductors pose a major challenge to India's AI ambitions. Export control regulations classify countries into three tiers, with India currently placed in Tier 2 alongside 150 other nations. Under this system:

- Tier 2 countries collectively receive no more than 25% of total chips produced
- Each individual Tier 2 country is further limited to 7% of the total production.

This allocation framework significantly limits India's access to advanced computing hardware. Currently, this translates to about 50,000 H100 chips, but with newer B200 chips entering the market, India's quota would fall to only 19,000–20,000 units over the next few years. Such numbers are insufficient for training multiple LLMs or running population-scale inference applications, given India's demographic size and digital adoption rates.

The inequity becomes apparent when comparing India's 1.4 billion population to smaller countries like Bhutan (700,000 people) or the Solomon Islands (800,000 people), all of which have the same 7% quota allocations as Tier 2 countries.

Further complexity arises from supply chain vulnerabilities. For example, Singapore receives 20% of total US chip exports but only 3% remain within Singapore, raising concerns about diversion to restricted markets. This illustrates the weaknesses of the current global distribution system and the need for stronger controls.

To address these challenges, experts advocate for reclassification based on strategic partnerships, factoring in trust indices, trade relationships, digital adoption, and population needs. Bilateral agreements could include entity-level monitoring, usage tracking, auditing systems, and telemetry data sharing to ensure chips are used appropriately and not diverted to adversarial parties.

Domestic Technical Development Efforts

India is planning a number of strategies to overcome these adverse circumstances in its AI development mission:

- Developing 28-nanometer semiconductor production capability within two years
- 25 chipset development projects spanning low-value high-volume and high-value low-volume products
- Completion of entirely in-house ATMP (Assembly, Test, Mark, Pack) process technology by Indian firms
- Construction of five fabrication units, with the first "Made in India" chips expected this year.
- Leveraging Edge AI opportunities through India's extensive 5G network for competitive differentiation.

Data Strategy and Sovereign Capabilities

India's data ecosystem is one of its greatest strengths. The country possesses vast repositories of biological data, facial recognition datasets, and diverse genotype-phenotype information unmatched in scale globally.

India's entertainment industry contributes significantly to its data advantage:

- Bollywood provides massive video datasets for computer vision applications
- T-Series manages the world's largest audio dataset, surpassing Hollywood in the volume of content
- The gaming industry continues to expand the pool of interactive and dynamic datasets for AI model training

However, a challenge persists in the distribution of talent. While 25–28% of global AI talent is of Indian origin, most top-tier AI researchers are based in Silicon Valley, working across the entire AI stack. This concentration of talent abroad limits India's ability to fully leverage its data advantages.

Systematic talent repatriation programmes are needed. Successful models include Israel's Yozma Programme in the 1990s and China's Thousand Talents initiative, which attracted PhD-level expertise back home through competitive compensation and research opportunities. These efforts typically require 15–20 years to yield substantial results.

According to the AI scaling law, global leadership requires three key advantages:

- Algorithmic excellence driven by top-tier talent
- Data diversity and access to unique datasets
- Compute capacity through access to advanced semiconductors

India is strong in data, but must improve its talent repatriation and access to compute infrastructure to be able to compete effectively at the global level.

Regulatory Framework and Governance

India's regulatory approach emphasizes pro-innovation policies, avoiding restrictive measures that could hinder growth. The Data Protection Act establishes frameworks for the free flow of data while maintaining:

- Consent-based controls for individuals
- Sector-specific residency requirements for sensitive sectors such as healthcare and finance

- Due process safeguards under Section 16 Subsection 2, ensuring that data residency is only enforced under exceptional circumstances

This nuanced framework prevents blanket data localisation mandates while still protecting critical sectors. It reflects growing confidence in AI as a driver of positive change rather than a source of fear.

The global AI summit trajectory mirrors this evolution:

- Bletchley Park Summit: Focus on safety and risk mitigation
- Korea Summit: Added innovation to safety discussions
- Paris Summit: Prioritised action-oriented outcomes
- Upcoming India Summit: Will focus on tangible impact and implementation

India's approach to AI safety prioritises technical solutions over heavy-handed regulation. A prime example is IIT Jodhpur's world-class defect detection system which accurately identifies AI-related risks. This illustrates how technology-driven approaches can mitigate societal harms while maintaining the innovation momentum.

Cyber security is a crucial area for India-US collaboration. Joint command centres with real-time intelligence sharing can protect both nations from increasingly sophisticated cyber attacks, and enhancing defence cooperation and shared resilience.

Economic Impact and Future Projections

India's electronics manufacturing sector has grown dramatically, as the following statistics show:

- The sector expanded fivefold over the past decade with a CAGR exceeding 18%
- Exports increased six fold with over 20% CAGR.

This rapid growth reflects India's scalable manufacturing capacity which can support AI hardware requirements and generate quality employment opportunities for rural populations moving into the formal economy.

Electronics are now recognised as a strategic "mother industry" due to their pervasive role across industrial sectors. However, the following gaps remain:

- Strong capabilities in mechanical and electrical manufacturing
- Weakness in key electronic components, such as lack of competitiveness in colour sorters

This challenge mirrors Vietnam's rice sector, which depends on Chinese electronic equipment despite strong domestic expertise in other areas.

The semiconductor sector faces a similar gap. Demand is expected to reach $110 billion annually by 2030, while the current annual manufacturing capacity is only worth $6–7 billion. This mismatch highlights the scale of investments and international cooperation needed to develop resilient global supply chains.

AI infrastructure development offers transformative potential. Early use cases include crop prediction, supply chain optimisation, and rural connectivity, all of which could address deep-rooted inefficiencies while creating entirely new categories of technology-enabled jobs.

Strategic Recommendations and Pathways

India's record of consistency in policy over three decades has fostered investor confidence, with no restrictions on capital repatriation even during economic crises. This strong track record provides a solid foundation for building trust in data governance and technology partnerships, assuring global partners of India's long-term reliability.

To fully realise its AI ambitions, India must adopt a coordinated approach across three critical areas:

1. Talent Development Building a deep and sustainable talent pool will be central to India's AI strategy. This requires a dual approach: repatriating highly skilled AI professionals currently working abroad and expanding domestic capacity through educational partnerships, fellowships, and targeted training programmes. Structured repatriation programmes, modelled on successful international initiatives, can systematically bring back expertise while creating opportunities for new generations of AI specialists.

2. Infrastructure Acceleration Strengthening compute infrastructure is essential to support population-scale AI applications. This will require bilateral cooperation on export control frameworks that balance national security concerns with strategic partnership goals. Comprehensive mechanisms for end-user verification, usage monitoring, and auditing will ensure trusted

technology transfer while preventing diversion of sensitive equipment to adversarial actors.

Regulatory Clarity

3. Transparent and predictable governance frameworks will encourage innovation and attract long-term investment. Clear rules around data residency, privacy, and cross-border flows will provide certainty for businesses while safeguarding citizens' interests. This clarity will also support deeper international collaboration and the development of shared standards for responsible AI deployment.

Edge AI Differentiation

India's unique combination of extensive 5G connectivity, a growing technical talent base, and emerging semiconductor fabrication capabilities creates a strong foundation for building a hybrid AI ecosystem. This ecosystem can seamlessly integrate cloud computing with edge processing, enabling:

- Device-level AI integration across smart phones, laptops, automobiles, XR headsets, robotics, and advanced manufacturing systems
- A leapfrogging opportunity to move beyond traditional cloud-centric models by adopting distributed edge-driven architectures
- Development of globally relevant solutions that leverage India's scale, cost efficiencies, and engineering expertise.

Edge AI has the potential to serve both domestic development needs and international commercial markets, allowing India to position itself as a global leader in next-generation AI applications. By harnessing its demographic scale and connectivity infrastructure, India can develop AI solutions that address local challenges while being scalable to other markets worldwide.

India's integrated strategy for AI and digital infrastructure development enables it to achieve global technology leadership while ensuring inclusive and sustainable growth. By aligning commercial incentives with developmental goals, and fostering strong international partnerships, India can transform productivity across key sectors and strengthen its role in global technology governance.

Sustained investments in talent, infrastructure, and governance will be crucial to achieving this vision. With its unparalleled data resources, expanding technical capabilities, and proven record of policy stability, India has the opportunity to shape the global AI landscape while delivering transformative benefits to its citizens and the broader international community.


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Scaling Inclusion: India's Digital Infrastructure Model

Digital public infrastructure (DPI) has emerged as a transformative tool for economic modernisation and social inclusion worldwide. India's strategy focuses on building scalable, interoperable, and secure platforms that place "e-" before essential services such as healthcare, payments, identity, and infrastructure. This approach reflects a systematic effort to digitise fundamental societal functions and deliver services efficiently and equitably.

The architecture is designed for simplicity and scale, enabling secure data exchange and reducing government expenditure through efficient payment systems. The cost advantages are striking. India's COVID tracking app was built by six engineers in Bangalore for just $100,000, while the equivalent system in the United Kingdom cost between $7–11 billion. This stark contrast highlights the transformative potential of DPI-driven digital service delivery.

Global Expansion of India's DPI Model

India's DPI model has gained international recognition, with over 40 countries adopting or exploring its open-source framework. The G20 presidency spotlighted these efforts, particularly during crises when traditional systems often fail.

Global implementation, however, faces hurdles. These include high upfront costs, legacy system integration, and limited technical capacity. Expanding DPI adoption in the Global South requires dedicated offices supporting digital transformation and triangular cooperation models involving India, the US, and recipient nations.

Initial resistance has given way to broader consensus. While Germany raised privacy concerns, Australia highlighted environmental issues, and Japan initially confused DPI with 5G. Countries have since agreed on core guiding principles for global DPI development.

Strategic Dimensions: India-US Partnership

The India-US digital partnership operates at two levels:

- Bilateral cooperation focused on market access, technology transfer, and talent mobility
- Global collaboration to deploy DPI solutions in developing nations

Bilateral negotiations address complex issues like data governance, intellectual property, and market access, while global efforts focus on shared development goals requiring institutional support and funding.

Key Partnership Elements:

- Quad DPI principles framework agreed upon by the US, India, Japan, and Australia
- Trust Initiative roadmap to be announced at the upcoming India-hosted Quad Leaders Summit
- Bilateral agreements progressing independently of multilateral frameworks
- India's 5G success story: lowest global data costs with the highest usage rates
- Fixed wireless access scaling to deliver last-mile broadband connectivity

Recent geopolitical shifts have created new opportunities for cooperation. With support from the current US administration, there is greater scope for joint infrastructure initiatives. Success, however, depends on sustained development finance and multilateral engagement to avoid a cycle where innovation occurs in the West but implementation happens elsewhere. India is well-positioned to become the global hub for democratic technology deployment while maintaining innovation partnerships with Western institutions.

China's Digital Strategy: A Defensive Approach

China's digital initiatives, such as the digital RMB, are largely defensive. The freezing of Russian assets during the Ukraine war heightened Beijing's concerns about the vulnerability of dollar-denominated reserves, especially as 54–57% of global trade settlements are in US dollars.

In response, China floated dollar bonds in Saudi Arabia, converting them to Hong Kong dollars to maintain settlement processes outside US oversight. Through the digital RMB, China enables net settlements in preferred currencies, bypassing SWIFT and traditional banking channels. This strategy aims to shield China from future financial restrictions rather than directly challenge the global financial system.

Driving Sustainable Business Models

Global scaling of DPI requires commercially viable models. While governments support digital transformation, financial resources and political will often fall short. Technology companies are responding with "DPI in a box" solutions, such as Google's cloud-based model, which simplify deployment.

Hyperscalers like Google, AWS, and Microsoft are partnering with open-source communities to create ecosystems involving access providers, philanthropies, and development organisations. This approach allows countries like Morocco, Papua New Guinea, Fiji, and Tonga to adopt advanced digital systems without extensive domestic infrastructure.

Sustainable financing remains a challenge. Public-private partnerships are needed to align commercial incentives with developmental goals. DPI systems could significantly cut transaction costs—currently 4–6% in merchant payments and 5% of global remittance value lost to fees—while creating new business opportunities for platform providers.

Private Sector Engagement and Commercial Applications

US technology companies are engaging deeply with India's DPI through practical applications. LinkedIn identified DigiLocker's verifiable credentials as an optimal global solution for professional verification. Meta, AWS, and Microsoft Azure have also shown interest in DPI-based systems to simplify operations and scale services.

In San Francisco, city officials expressed interest in Open Mobility solutions under the Open Network for Digital Commerce (ONDC) framework, which offer alternatives to ride-sharing platforms charging 25% commissions. Such solutions could lower costs, address taxi union concerns, and improve service access.

India's capabilities are also expanding domestically. VVDN has developed 5,000 design engineers across six centres, building a foundation for original design manufacturing (ODM) that supports global supply chains while maintaining competitive costs and quality.

Global South Market Strategy

The Quad partnership established shared DPI principles, addressing concerns about privacy, sovereignty, and technical standards. These principles form the foundation for cooperative technology development.

Key strategies for scaling in the Global South include:

- Using India as a hub for deploying digital infrastructure
- Moving beyond bilateral trade toward multilateral technology partnerships
- Triangular cooperation for technical capacity building
- Leveraging Indian engineering expertise with US financial support for cost-effective scaling

The trust framework ensures DPI remains interoperable, shareable, and reusable, preventing monopolistic control while encouraging private sector investment. Growing participation by major technology companies signals positive momentum for sustainable and collaborative development models.

India's DPI model represents a powerful tool for inclusive growth and global digital transformation. Through strategic partnerships, sustainable business models, and strong governance, India is positioned to lead the next phase of digital infrastructure development.

ABBREVIATIONS

AI	Artificial Intelligence
API	Application Programming Interfaces
ASIA	Autonomous Systems Industry Alliance
ATMP	Assembly, Test, Mark, Pack
BECA	Basic Exchange and Cooperation Agreement
BMR	Bharat Modular Reactor
BSR	Bharat Small Reactor
BTA	Bilateral Trade Agreement
CET	Critical and Emerging Technologies
COMCASA	Communications Compatibility and Security Agreements
DAP	Defence Acquisition Procedure
DFI	Development Finance Institution
DTTI	Defence Technology and Trade Initiative
EFTA	European Free Trade Association
ELINT	Electronic Intelligence
EODB	Ease of Doing Business
EQF	European Qualifications Framework
EU	European Union
EV	Electric Vehicle
FDA	Food and Drug Administration
FDI	Foreign Direct Investment
FMCG	Fast-Moving Consumer Goods
FMWG	Fast-Moving Wellness Goods
FTA	Free Trade Agreement
GCC	Gulf Cooperation Council
GCC	Global Capability Centre
GW	Gigawatts
G2G	Government-to-Government
GPU	Graphics Processing Unit
GVC	Global Value Chain
HAPS	High Altitude Pseudo Satellites
I2U2	India, Israel, UAE, US
ICET	Initiative on Critical and Emerging Technologies
IFC-IOR	Information Fusion Centre for the Indian Ocean Region
IMEC	India-Middle East-Europe Economic Corridor
IPMDA	Indo-Pacific Maritime Domain Awareness
ISR	Intelligence, Surveillance, and Reconnaissance
ISRO	Indian Space Research Organisation
ITAR	International Traffic in Arms Regulations
JADC2	Joint All Domain Command and Control
LLM	Large Language Model
LEMOA	Logistics Exchange Memorandum of Agreement
LEO	Low Earth Orbit Congestion
MBD	Mission-Based Deployments
MDA	Maritime Domain Awareness
MSME	Micro, Small and Medium Enterprises
MSP	Mineral Security Partnership
MW	Megawatts
NORKA	Non-Resident Keralites Affairs
ODM	Original Design Manufacturing
ONDC	Open Network for Digital Commerce
OSAT	Outsourced Semiconductor Assembly and Test
OSINT	Leveraging Open-Source Intelligence
PHWR	Pressurised Heavy Water Reactors
PLASSF	People's Liberation Army Strategic Support Force
PLI	Production-Linked Incentive
PPP	Public-Private Partnership
RCEP	Regional Comprehensive Economic Partnership
RDPA	Reciprocal Defence Procurement Agreement
SAR	Synthetic Aperture Radar
SMR	Small Modular Reactors
SSA	Space Situational Awareness
STA	Strategic Trade Authorization Level 1
TITP	Technical Intern Training Program, Japan
TCM	Traditional Chinese Medicine
TOR	Terms of Reference
TRUST	Transforming the Relationship Utilising Strategic Technology
UAE	United Arab Emirates
US	The United States (of America)
UNCLOS	UN Convention on the Law of the Sea
WTO	World Trade Organization

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