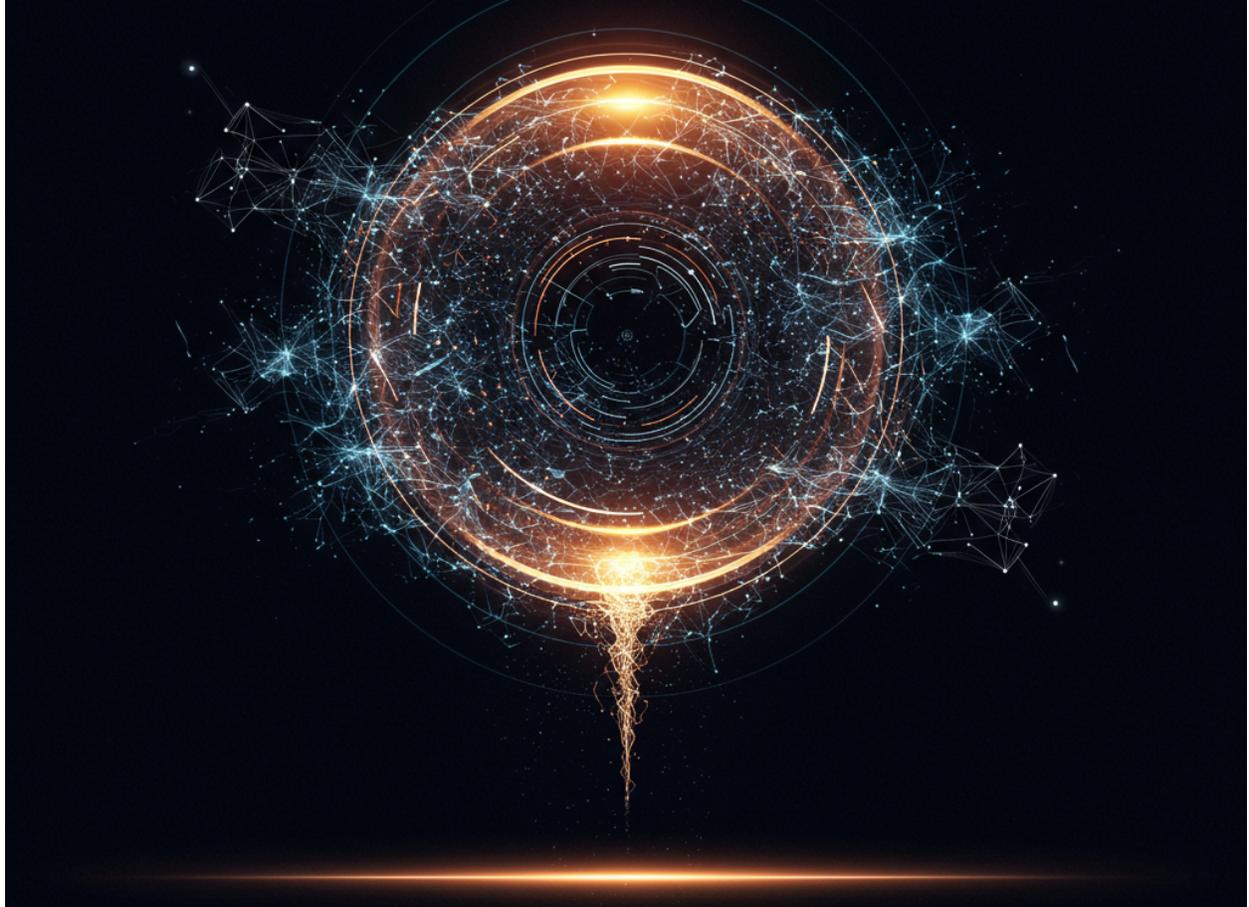


# Technological Progress Report - India 2025

India in 2025 stands at a pivotal juncture in its technological journey, marked by ambitious government initiatives, rapid adoption of emerging technologies, and a growing innovation ecosystem. The nation is demonstrating a clear shift from being merely a service provider to a significant player in deep technology, fostering self-reliance and global leadership in key sectors.



# 1. Digital Public Infrastructure (DPI) & Connectivity: The Backbone of Digital India

The "Digital India" campaign, celebrating its 10th anniversary in July 2025, has successfully laid a robust foundation for a digitally empowered society.

**Connectivity Expansion:** India's telecommunication landscape has witnessed phenomenal growth. Total telephone connections have surged to over 120 crores by April 2025, with internet connections growing by 285% in 11 years to nearly 97 crore by June 2024. The tele-density has increased from 75.23% to 84.49% by October 2024.

**5G Revolution:** Launched in October 2022, 5G deployment has been exceptionally rapid, with 4.74 lakh 5G towers set up in just 22 months, covering 99.6% of districts by early 2025. This high-speed connectivity is accelerating digital services and enabling advanced applications.

**BharatNet:** This ambitious project has connected over 2.18 lakh Gram Panchayats with high-speed internet by January 2025, laying nearly 6.92 lakh km of optical fibre cable, significantly bridging the rural-urban digital divide.

**Unified Payments Interface (UPI):** UPI continues to be a global benchmark for real-time payments. In April 2025 alone, over 1,867.7 crore UPI transactions worth \$24.77 lakh crore were processed, with nearly 460 million people and 65 million merchants utilizing the platform. India accounted for 49% of global real-time transactions in 2023.

**Aadhaar and DigiLocker:** With 142 crore Aadhaar IDs generated by April 2025, the Aadhaar-based e-KYC system has streamlined verification processes across banking and public services. DigiLocker, launched in 2015, has reached 53.92 crore users by June 2025, providing secure digital access to documents and reducing paperwork.

## 2. Emerging Technologies: Driving Innovation

India is making significant strides in cutting-edge technologies, backed by strategic government initiatives and a vibrant startup ecosystem.

### Artificial Intelligence (AI)

AI is a core focus area, with India recognized among the top countries globally for its AI skills, capabilities, and policies.

**Government Push:** The "IndiaAI" initiative aims to foster inclusion, innovation, and adoption. High-end compute facilities like AIRAWAT, with 34,381 GPUs, are providing affordable access to startups and researchers. Plans are underway for indigenous GPU development within 3-5 years.

**AI Centers of Excellence (CoEs):** Three AI CoEs are established in healthcare, agriculture, and sustainable cities, with significant funding. Five National CoEs for AI skilling are also being set up in collaboration with global partners.

**Applications & Integration:** AI is being integrated into Digital Public Infrastructure (DPI). Notable applications include AI-powered crowd and transport management for Mahakumbh 2025 and Bhashini-powered multilingual chatbots for police and railways. In agriculture, an AI chatbot integrated with PM-Kisan is assisting farmers with queries and grievances. AI is also becoming a critical weapon in combating financial fraud through real-time detection and risk management.

**Generative AI Ecosystem:** The Indian GenAI startup ecosystem has seen substantial investment, raising \$524 million in the first seven months of 2025. This surge is driven by enterprise adoption for automation, vertical-specific solutions, voice AI, and agentic AI platforms. The focus is shifting towards verticalization, with startups building domain-specific AI models for sectors like finance and healthcare.

**Talent Development:** India ranks 1st in global AI skill penetration, with a 263% talent growth since 2016. Efforts include expanding AI education in premier institutions (IITs, NITs) and establishing AI labs in Tier 2 and Tier 3 cities to decentralize innovation. The AI industry is projected to reach USD 28.8 billion by 2025, with 1 million AI professionals by 2026.

**Ethical AI:** India is adopting a techno-legal approach to AI regulation, focusing on safeguards for deepfakes, privacy, and cybersecurity, while fostering frameworks without overregulation.

## Semiconductor Manufacturing

A strategic priority, India is accelerating its efforts to establish a robust domestic semiconductor ecosystem.

**India Semiconductor Mission (ISM):** With cumulative investments of around \$1.60 lakh crore across 6 states, ISM has approved 10 projects.

**New Facilities:** Four new semiconductor projects, totaling approximately \$4,600 crore in investments, were approved in August 2025. These include:

**SiCSem (Odisha):** Integrated Silicon Carbide (SiC) compound semiconductors for EVs, defense, railways, and solar inverters.

**3D Glass Solutions Inc. (Odisha):** Advanced packaging and embedded glass substrate unit for defense, high-performance computing, AI, and RF applications.

**ASIP (Andhra Pradesh):** Semiconductor production for mobile phones, set-top boxes, and automotive components.

**CDIL (Punjab):** Enhancement of discrete semiconductor manufacturing for automotive electronics and renewable energy.

**"Made in India" Chip:** Prime Minister Narendra Modi announced that a "Made in India" chip, built in India, will arrive in the market by the end of 2025, marking a significant milestone towards self-reliance.

**Design Capabilities:** Government-provided design infrastructure supports 278 academic institutions and 72 startups, fostering indigenous R&D with 20 chips already fabricated from 17 institutions.

## Advanced Manufacturing

India is poised for a manufacturing leap, transitioning from a low-cost production hub to an innovation-led growth economy.

**Key Sectors:** Precision engineering, aerospace, EV components, semiconductors, robotics, and advanced materials are identified as high-potential sectors.

**Policy Support:** Production-linked Incentive (PLI) schemes and fresh R&D incentives are creating a favorable macro-environment.

**Technology Adoption:** AI-driven design, robotics, additive manufacturing, and IoT-enabled automation are seen as essential for future success.

## Other Emerging Technologies

**Blockchain:** Increasing adoption for secure, transparent transactions in financial and supply chain sectors, with government initiatives like the Centre of Excellence in Blockchain Technology.

**IoT & Digital Twins:** Utilized in smart cities for traffic management, energy optimization, and public safety, and in industries for virtual replicas of physical systems.

**Augmented Reality (AR) & Virtual Reality (VR):** Gaining momentum in retail (virtual try-ons), healthcare, and education (enhanced learning experiences).

**Green Tech:** Growing focus on renewable energy, electric vehicles (EVs), and sustainable practices in line with global demand for greener solutions.

**Quantum Computing:** Emerging applications in cryptography and drug discovery.

### 3. Government Initiatives & Collaborative Ecosystem

The Indian government is actively fostering a conducive environment for technological growth through various initiatives and collaborations.

**Mission Karmayogi & iGOT:** This platform is training civil servants, with over 1.21 crore officials onboarded and 3.24 crore learning certificates issued by May 2025, to equip them with essential digital skills.

**STIC-2025 & ET Soonicorns Summit 2025:** High-profile events like the Emerging Science, Technology, and Innovation Conclave (ESTIC) and the ET Soonicorns Summit are bringing together policymakers, industry leaders, startups, and global visionaries to discuss and shape India's technological future, especially in AI, infrastructure, security, and ethics.

**State-Level Digital Transformation:** States like Uttarakhand are embracing "Hill to Hi-Tech" mantras, launching initiatives such as remote sensing and drone application centers, dedicated IT cadres, and AI-based features in citizen helplines to improve governance and service delivery.

## 4. Economic Impact & Workforce Development

Technology is a significant contributor to India's economic growth and is reshaping its workforce.

**Digital Economy's Contribution:** The digital economy contributed 11.74% to India's GDP in 2022-23 and is projected to reach 13.42% in 2024-25, underscoring its growing importance.

**Fintech Revolution:** Digital payment systems, especially UPI, have revolutionized financial transactions, boosting financial inclusion.

**Talent Growth:** India continues to focus on skilling and reskilling its workforce to meet the demands of emerging technologies. Programs like FutureSkills Prime and the expansion of AI training in academic institutions are crucial.

**Global Capability Centers (GCCs):** Over 1,700 GCCs are operating in India, employing nearly 2 million people and contributing 23% to India's IT exports. Their evolving role, focusing on AI, cybersecurity, analytics, and R&D, signifies a deeper integration into global technology operations.

## Conclusion

In 2025, India's technological progress is characterized by a strong emphasis on digital inclusion, self-reliance in critical technologies like semiconductors, and a proactive embrace of AI and other emerging innovations. The synergy between government vision, industry investment, and a burgeoning startup ecosystem is positioning India as a global leader in the evolving digital landscape, paving the way for a stronger, smarter, and more self-reliant "Viksit Bharat" by 2047.