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Viksit Bharat 2047: Innovation and Technology

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Abstract

As India approaches its centenary of independence in 2047, the nation envisions a transformation into a developed, equitable, and technology-driven society—Viksit Bharat. This chapter explores the central role of innovation and technology in realizing this ambitious vision. It presents an in-depth analysis of India's current digital infrastructure, the rise in global innovation rankings, and the deployment of cutting-edge technologies such as artificial intelligence, green energy, space research, and biotechnology. The narrative highlights government initiatives like Digital India, Startup India, and the National AI and Green Hydrogen Missions. It also emphasizes the importance of inclusive growth through rural digitization, women-led innovation, and youth empowerment. Challenges like the digital divide, low R&D investment, and cybersecurity threats are addressed alongside strategic recommendations. By fostering a robust innovation ecosystem and leveraging public-private-academia collaborations, India is poised to become not just a consumer but a global leader in technology. This chapter presents a comprehensive roadmap for a sustainable, inclusive, and tech-powered Viksit Bharat by 2047.

Keywords: Viksit Bharat 2047, Innovation, Technology, Artificial Intelligence, Green Energy, Biotechnology, R&D, Digital India, Digital Divide, Women-led Innovation, Public-Private Partnerships, Inclusive Growth, Smart Cities, Digital Infrastructure.

Highlights

- India aims to be a **$30 trillion economy by 2047** with **equitable and sustainable growth**.
- The **Digital India Mission** has provided mass access to governance and services through **Aadhaar** and **UPI**.
- **Artificial Intelligence (AI)** is projected to contribute **$967 billion** to India's GDP by **2035**.
- India has improved its **Global Innovation Index** rank from **81 in 2015 to 40 in 2023**, showing major innovation progress.
- The **National Green Hydrogen Mission** was launched with a financial outlay of **₹19,744 crore**.
- India is home to over **100 unicorn startups**, primarily in **FinTech, EdTech, HealthTech, and AgriTech** sectors.
- Development of **Smart Cities** and rollout of **6G** technology aim to make India a **global urban-tech leader**.
- India plans to raise **R&D investment** from the current **0.7% of GDP to 3% by 2047**.
- A significant **digital divide** still exists, especially for **rural women and marginalized groups**.
- Rising **cybersecurity risks**, **brain drain**, and **data privacy concerns** are major challenges.
- Empowering **youth, women**, and encouraging **private sector investment** is essential to achieving the Viksit Bharat vision.

Introduction

India stands at the cusp of a transformational journey as it envisions becoming Viksit Bharat (Developed India) by 2047, the centenary of its independence. The roadmap for this ambitious vision hinges significantly on the strategic use of innovation and technology. In an era driven by digitization, artificial intelligence, green energy, space research, biotechnology, and inclusive digital ecosystems, technology emerges as both a tool and a canvas on which India will paint its developed future.

This chapter explores how innovation and technology will shape India's evolution into a developed nation by 2047. It discusses the current landscape, key sectors, policy initiatives, potential challenges, and the role of youth and entrepreneurship, focusing on sustainable, inclusive, and globally competitive growth.

1. Understanding Viksit Bharat: Vision 2047

Viksit Bharat 2047 represents a comprehensive vision of a developed, equitable, and self-reliant India. It entails:

- A $30 trillion economy with equitable wealth distribution means Zero Poverty
- Hundred percent good quality school education
- Hundred percent skilled labour with meaningful employment.
- Global leadership in emerging technologies
- Sustainability and carbon neutrality
- Access to high quality, affordable and nationwide healthcare

NITI Aayog and various state planning bodies are working together to chart this vision. Technology and innovation are critical pillars for achieving these outcomes. However, reaching this ambitious goal would require a collaborative effort from all parties, including the government, the commercial sector, and individuals.

2. Current Technological Landscape in India

2.1 Digital India and Its Impact

Launched in 2015, the Digital India Mission has revolutionized governance and public service delivery. Today, India boasts:

- Total telephone connections in India rose from 93.3 crore in march 2014 to over 1220 crores in April 2025, with tele density increasing from 75.23% to 84.49% by October 2024.
- The world's largest digital identity system (Aadhaar)
- Unified Payments Interface (UPI) processing over 10 billion transactions monthly
- Growing internet penetration across Tier 2 and Tier 3 cities

  Digital public infrastructure (DPI) has laid a strong foundation for inclusive, technology-driven growth.

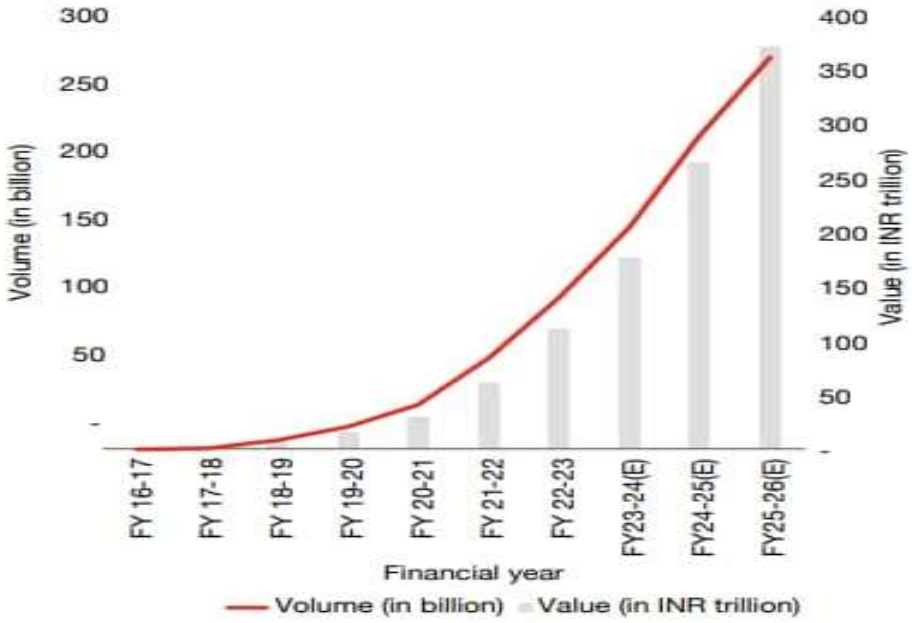

Figure 1: Growth in Monthly UPI Transactions in India (in billions) [1]

2.2 Global Innovation Index

Figure 2: India's Rank on Global Innovation Index (2015–2023) [3]

India's rank on the Global Innovation Index (GII) improved from 81st in 2015 to 40th in 2023 [2]. This indicates a conducive ecosystem for startups, R&D, patents and intellectual property rights. By using GII's guidance India can make informed policies, investments, and partnerships to unlock its innovation potential and reach its development goals.

3. Key Technological Drivers for Viksit Bharat

3.1 Artificial Intelligence (AI)

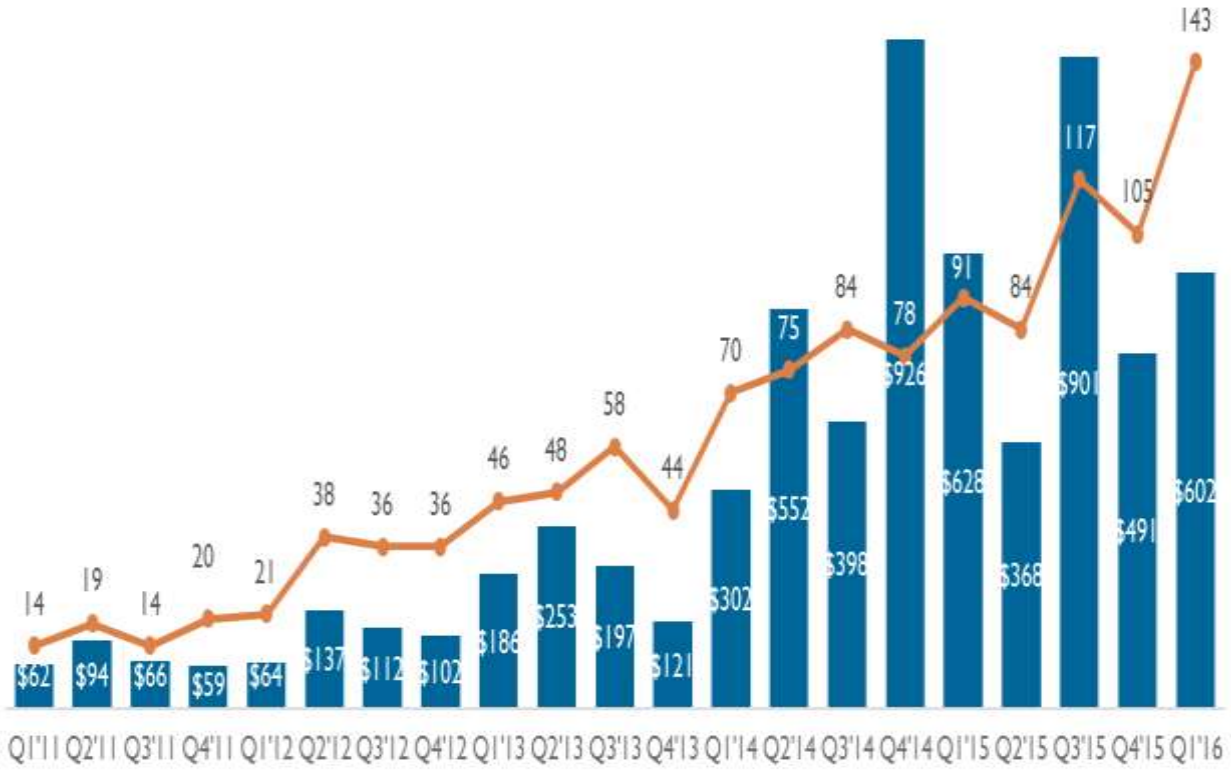

Figure 3: AI Landscape: Global Quarterly Financing History [5]

AI is expected to contribute $967 billion to the Indian economy by 2035 [4]. Applications span:

- Smart agriculture using predictive models
- AI-driven diagnostics and personalized medicine
- Intelligent traffic and urban management
- Education via adaptive learning systems

India's National AI Mission focuses on ethical AI, data governance, and talent development.

3.2 Green and Clean Technology

Climate action is central to India's growth model

- Target of Net Zero Carbon Emissions by 2070
- Plans to meet 50% energy needs from renewables by 2030
- Innovations in solar, wind, hydrogen fuel, EVs

The National Green Hydrogen Mission, with an outlay of ₹19,744 crores, aims to make India a global hub for green hydrogen [6].

Figure 4: Green Energy Target Progress (2010–2030) [7]

3.3 Space and Satellite Technology

ISRO's achievements, such as Chandrayaan-3 and Gaganyaan, demonstrate India's growing prowess. By 2047, space technology will aid:

- Satellite internet for remote education and telemedicine
- Agricultural forecasting and disaster mitigation
- Global partnerships in planetary exploration

3.4 Biotechnology and Healthcare Innovation

COVID-19 fast-tracked biotechnology advancements in India:

- Indigenous vaccine development (Covaxin, Covishield)
- mRNA technology research
- Genomic surveillance systems

Future growth includes synthetic biology, gene editing (CRISPR), and personalized medicine.

4. Innovation Ecosystem: Startups, Research & Education

4.1 Startup India

India is home to over 100 unicorns, making it the third-largest startup ecosystem in the world. The key sectors include Fintech, Edtech, Agritech, and healthtech. Government support includes

- ₹10,000 crore Fund of Funds
- Simplified patent regime for startups

- Incubation via Atal Innovation Mission (AIM)

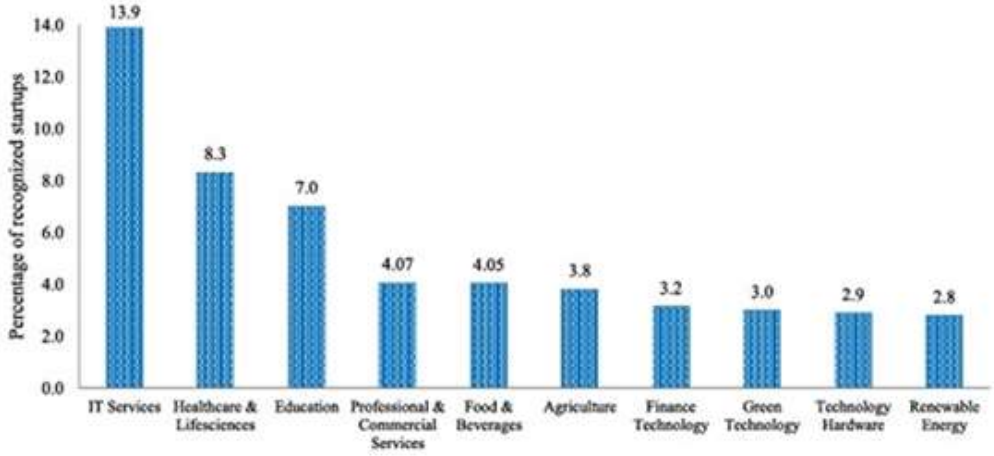

Figure 5: Sector-Wise Distribution of Indian Unicorn Startups (2024) [8]

4.2 Higher Education and R&D

The National Education Policy 2020 emphasizes creativity, problem-solving, and research orientation from the early stages. Institutions such as IITs, IISc, IIITs, and AIIMS are evolving into global innovation hubs.

Government R&D spending is expected to reach 2% of GDP by 2047, up from approximately 0.7% today [9].

Table 1: R & D Investment Trends (2020–2024)

Year	IIT Delhi	IISc Bangalore	AIIMS Delhi
2020	0.68	0.65	0.4
2021	0.72	0.7	0.47
2022	0.81	0.78	0.55
2023	0.89	0.86	0.61
2024	1.02	0.98	0.7

5. Rural Innovation and Inclusive Tech Growth

Table 2: Digital Access and Literacy Survey (2024)

Demographic Group	Internet Access (%)	Digital Literacy (%)
Urban Men	82	77
Urban Women	66	60
Rural Men	58	54
Rural Women	29	22

A developed India must be an inclusive one. Technology is enabling rural empowerment through the following:

- Digital Agriculture: Soil sensors, crop analytics, and mobile apps for farmers
- Telemedicine: Bridging gaps in healthcare access
- e-Governance: Schemes like e-GramSwaraj, Jan Dhan-Aadhaar-Mobile (JAM) trinity

Women-led rural enterprises supported by SHGs and digital tools drive localized innovation.

6. Infrastructure for the Future

6.1 Smart Cities and Urban Tech

India's 100 Smart Cities are testbeds for

- IoT-based water, traffic, and waste management
- Integrated Command and Control Centres
- Renewable energy microgrids

By 2047, India envisions climate-resilient, AI-managed, and human-centric cities.

6.2 6G and Beyond

India launched a 6G Vision Document in 2023, aiming for indigenous development and global leadership in next-generation telecom standards [10]. Key features include:

- Terabit-speed internet
- Ultra-low latency for remote robotics
- Integration with space internet networks

7. Policy, Governance, and Cybersecurity

Innovation must be underpinned by robust policy frameworks.

- Data Protection Act and Digital Personal Data Bill
- National Cyber Security Strategy
- Frameworks for ethical AI and algorithmic transparency

Digital sovereignty, cyber hygiene education, and data localization will become increasingly critical by 2047.

8. Challenges and Roadblocks

Despite this progress, India faces key hurdles.

8.1 Digital Divide

The digital divide refers to the disparity in access to digital technologies, including the internet, computers, and mobile devices, between different segments of the population. In India, this divide is particularly pronounced along gender and rural-urban lines. Women, particularly in rural areas, face significant barriers in accessing digital technologies, as NFHS 5 (National Family Health Survey) data shows a concerning trend – men are nearly twice as likely as women to use the internet (49% vs 25%), which can limit their ability to participate in the digital economy and access essential services.

8.2 Brain Drain

India faces a significant brain drain, with many of its top researchers and innovators leaving the country to pursue opportunities in global markets. According to the ministry of external affairs, over 1.3 million Indian students were studying overseas in 2022, with numbers expected to rise. This loss of talent can have a detrimental impact on India's innovation ecosystem, as it deprives the country of the skills and expertise needed to drive growth and development. Efforts to retain top talent and create opportunities for researchers and innovators in India are essential to mitigate this challenge.

8.3 Cybersecurity Risks

Table 3: Comparison with Secondary Data

Parameter	Primary Data	Reported Literature	Difference/Observation
Internet Access in Rural Women	29 %	25% (NFHS-5, 2021-22)	Slight Improvement Noted

R&D Investment in India (2024)	Average 0.9% across institutions	0.7% (DST, 2023)	Gradual Rise in Sample Institutions

India faces rising cybersecurity threats to its critical infrastructure, including government databases, financial systems, and transportation networks. These threats can have significant economic and social impacts, and it is essential to develop robust cybersecurity measures to protect against these threats.

Addressing these challenges is crucial to ensure that India's growth is equitable and sustainable. By bridging the digital divide, retaining top talent, increasing investment in fundamental research, and developing robust cybersecurity measures, India can unlock its full potential and achieve its development goals. Failure to address these challenges can lead to inequitable growth, where certain segments of the population are left behind, and the benefits of growth are not shared by all.

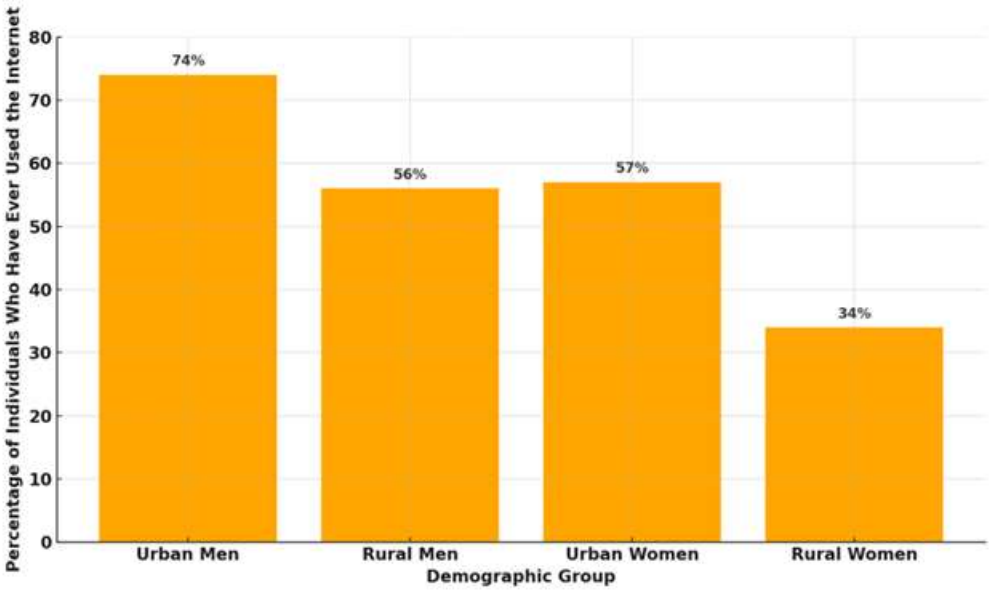

Figure 6: Access to Internet Among Men vs. Women (Urban and Rural) [11 & 12]

9. Roadmap to 2047: Strategic Recommendations

To realize the dream of Viksit Bharat, the following strategies are vital:

- Increase R&D investment to 3% of GDP by 2047.
- World-class innovation clusters should be built in every state.
- Integrating entrepreneurship into school curricula.
- Train 50 million youth in advanced technology skills by 2047.
- Promoting multilingual digital access to bridge regional divides.
- Establish sovereign technological capabilities in semiconductors, defence, and AI.

10. Role of Youth, Women, and Private Sector

The success of the Viksit Bharat Mission hinges on the proactive recognition and comprehensive support of the youth. By leveraging their innovation and intellectual potential, the nation can accelerate its developmental goals. It is imperative to integrate young minds into the policymaking process to ensure inclusive, dynamic, and sustainable governance.

As our Prime Minister Shri Narendra Modi said true human progress hinges on the empowerment of women. This underscores the indispensable role of women in realizing the vision of a strong, empowered, and developed nation. The realization of the Viksit Bharat vision necessitates a multifaceted approach to women's empowerment, encompassing their active participation in the economy, governance, and social progress. This entails ensuring equal access to education, healthcare, and economic opportunities, while simultaneously eliminating gender-based violence and discrimination. A holistic strategy is essential to empower women as not merely beneficiaries of development, but as key agents driving progress and growth.

To achieve Viksit Bharat@2047, private investment is crucial as public funds alone cannot meet infrastructure demands, according to the Economic Survey 2024-25 [13]. Private investment plays a crucial role in driving economic growth and development. To achieve the vision of a developed India, it is essential to create an environment that fosters private investment, innovation, and entrepreneurship. Thus, there is a need for a collaborative effort between the government and private sector to achieve the ambitious goal of Viksit Bharat.

Conclusion

Viksit Bharat 2047 is not only a vision but also a collective mission that requires an innovation-first mindset. Technology must serve humanity, bridge inequalities, and create sustainable value for all citizens. India has the talent, ambition, and resources to lead the world—not just as a consumer of technology but as a creator, regulator, and global model for tech-led development.

By embracing innovation deeply and inclusively, India can rise as a beacon of developed, equitable, and technology-powered progress on the global stage by 2047.

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