



Driving Digital Transformation: India's Strategic Investments in Emerging Technologies and the Vision of Viksit Bharat

Dr. Himanshu Yadav*

Abstract

India's goal of becoming a developed nation, under the vision of "Viksit Bharat," is strongly linked to its investment in emerging technologies like Artificial Intelligence (AI), machine learning, blockchain, and the Internet of Things (IoT). It is actively using these technologies to drive digital transformation and improve its global competitiveness by focusing on key initiatives like the National AI Strategy and National Blockchain Strategy show India's dedication to using these technologies to solve societal issues and create inclusive growth. India is working on fostering innovation, encouraging entrepreneurship, and developing expertise in these technologies through a multifaceted approach. Through the AI Strategy India plans to concentrate on fostering research and development, aiding collaboration among academia, industry, and government, and promoting AI adoption across various sectors using the transformative potential of AI to advance various sectors like healthcare and agriculture. Furthermore, the National Blockchain Strategy focuses on exploring blockchain technology's applications to enhance governance, finance, supply chain management, and other areas. Pilot projects, regulatory frameworks, and capacity-building initiatives will be implemented to deploy blockchain solutions which will address challenges in identity management, land records, financial inclusion, and supply chain transparency. India's emphasis on the Internet of Things (IoT) and machine learning strengthens its drive toward digital transformation across sectors. Initiatives like the Smart Cities Mission and Digital India illustrate the use of IoT for smart infrastructure, urban development, and improved public services. Additionally, investments in machine learning and data analytics seek to leverage data for decision-making and optimization in government and industry. India's commitment to emerging technologies under the Viksit Bharat vision underscores its pursuit of innovation for societal and economic prosperity. India aims to utilize advanced technologies such as AI (Artificial Intelligence), Machine Learning, blockchain, and IoT (Internet of Things) to tackle intricate issues, improve governance processes, and solidify its status as a prominent digital leader in the modern technological driven world .

Background

In 2022, the Government of India unveiled the Viksit Bharat agenda, which outlines a 25-year vision to make India a developed nation by 2047. A key aspect of this agenda is leveraging emerging technologies to boost India's standing in global affairs. This paper examines how technologies like artificial intelligence, blockchain, 5G and quantum computing can help India achieve its goals under Viksit Bharat and enhance its geopolitical influence. Viksit Bharat Agenda 2047

The Viksit Bharat agenda aims to make India a high-income country by 2047 with equitable access to development for all citizens. Key focus areas include upgrading infrastructure, boosting manufacturing, enhancing research and development

* Assistant Professor, Department of Political Science, S.P.M.College, Prayagraj



capabilities, achieving energy independence and improving the ease of living for all Indians. The agenda recognizes that technology will be a critical enabler for development across sectors. The agenda involves harnessing emerging technologies such as AI and block chain for global affairs, which underscores the importance of technology in realizing India's vision of becoming a developed country . India has set a goal of becoming a developed country by 2047 through the lens of Viksit Bharat. Emerging technologies such as AI and Block chain are viewed as critical tools in achieving this vision. In fact, a survey conducted by Primus Partners highlights the importance of technology in realizing India's vision of becoming a developed country . Technology is essential to achieving comprehensive human development, infrastructure development, social equity, economic prosperity, and cyber security.

To realize the goals of the Viksit Bharat agenda, dynamic and transformative solutions are necessary to stimulate growth in India's economy and society . The role of technology will play a pivotal role in this growth, with emerging technologies such as AI and Block chain serving as key drivers . Emerging Technologies boosting India's Global Standing .Some key technologies in this scheme include:

1. Artificial Intelligence

India aims to become a global AI hub under the Viksit Bharat vision. With a huge talent pool in IT and engineering, India can leverage AI for better public service delivery, smart infrastructure, increased agricultural productivity, improved healthcare and more. Indian AI startups are already making strides globally. India's proficiency in AI can elevate its stature in international cooperation on emerging tech governance. Furthermore, AI is expected to play a significant role in India's prowess in 2047 . As such, implementation and policy formulation will be critical strategic steps towards achieving the Viksit Bharat agenda .

2. Block chain

Block chain can transform governance in India by enhancing transparency, traceability and audit ability . It can help streamline public systems and service delivery. India is already piloting block chain in education, healthcare and agriculture. As a leader in block chain-enabled government services, India can shape global norms and regulations around block chain.

3. 5G and It

The rollout of 5G in India will unleash next-generation capabilities like smart cities, industrial automation and autonomous vehicles. India is well positioned to become a 5G export hub. 5G will be a launch pad for the Internet of Things (IoT), which can make cities, transport networks and utilities more efficient. India's technology services firms can drive 5G and It innovation globally.

4. Quantum Computing

India recently unveiled a National Mission on Quantum Computing to boost research and commercialization. Quantum computing could revolutionize materials design, drug discovery and machine learning. As a frontrunner in quantum, India can attain prominence in global cyber security and computing paradigms. India's talent pool can drive global quantum research and product development.



India's Global Standing

These emerging technologies can boost India's global standing by strategic deployment and positioning India as a hub for AI, quantum computing, block chain, 5G, and other emerging tech through policy initiatives like Digital India. By building world-class technology infrastructure and talent pool to attract global tech companies and investment and synergizing emerging tech with flagship programs like Make in India, Skill India, Smart Cities to showcase technological capability. Also promoting Indian technology prowess and knowledge exports through digital diplomacy. It can assert potential influence by shaping global governance mechanisms, ethics, and standards around emerging tech through leadership in international forums and leveraging technology diplomacy for developmental cooperation in areas like fintech, healthtech, edtech with developing countries. It's forging strategic technology partnerships through platforms like QUAD, I2U2 to expand India's sphere of influence whereas also enhancing India's soft power and building global brand as a responsible, democratic technology powerhouse.

It has a profound geopolitical impact by creating a Technological edge in key sectors like IT, biotech, space tech amplifying India's hard and soft power and deploying AI, quantum, cyber tech for national security, bolstering strategic autonomy. It's leadership in IoT, communications tech strengthening connectivity and integration with strategically important regions and it is Dominating in technology standards setting (5G) and platform ecosystems boosting economic and diplomatic leverage globally. Also, it is collaborating in emerging tech reshaping geopolitical alignments and alliances.

Rationale

This study provides a timely analysis of how India can utilize emerging technologies to further its development goals and global standing, as outlined in the forward-looking Viksit Bharat agenda. The agenda sets ambitious targets for India to become a leading economic power in the global scenario by 2047. While existing literature has examined the agenda's policy priorities in infrastructure, manufacturing and human development, there has been limited scholarship on the specific role of technologies like AI, block chain and quantum computing in empowering India's national growth strategies. This study addresses that gap by conducting an in-depth investigation of the opportunities and challenges in leveraging emerging technologies under Viksit Bharat. The analysis will provide actionable insights for policymakers and technology leaders on how to optimally harness innovations in digital ecosystems, data systems, intelligent automation and advanced computing for economic, social and strategic gains. Examining the geopolitical implications also highlights India's potential to shape global governance of emerging technology norms and standards. Overall, this research will make a significant contribution by delineating how proactive policies and prudent implementation of emerging technologies can act as key enablers for India to achieve Viksit Bharat goals and enhance its influence as a democratic technology leader and global power.

Discussion and Analysis

Understanding the importance of these technologies, there are certain strategic steps India can take to harness these technologies:



1. R&D Initiatives

- Boosting investment in R&D to at least 2% of GDP as envisioned in the Science, Technology and Innovation Policy 2020.
- Fostering research centers of excellence and interdisciplinary collaborations focused on emerging tech like AI, robotics, IoT.
- Strengthening mechanisms like Technology Development Fund to support commercialization of innovations.
- Focusing R&D on technologies that address societal priorities like healthcare, agriculture, environmental sustainability.
- Developing sandbox frameworks to enable testing and validation of new technologies.

2. Collaboration

- Building synergies between industry, academia and government through digital innovation hubs.
- Incentivizing joint research projects between public institutions like IITs, IISc and private sector technology firms.
- Creating platforms for open innovation, knowledge exchange on emerging technology trends.
- Leveraging diaspora networks to facilitate transfer of knowledge and tech capabilities.

3. International Cooperation

- Proactive role in shaping conversations on ethics, norms and standards for emerging tech.
- Strategic partnerships with leading technology nations to strengthen expertise in frontier technologies.
- Faculty/student exchanges, workshops and tech summits to increase global connectivity.
- Joint initiatives with developing countries for contextual deployment of emerging technologies.

Also, for inclusive and sustainable development while balancing innovation with ethical considerations and addressing potential risks and challenges like data privacy and security, India can leverage its digital strengths and proactive policies like:

Ethical Consideration

- i) Establishing guidelines and standards for responsible AI development and use across sectors.
- ii) Fostering public debate and building awareness on ethical issues related to emerging tech.
- iii) Prioritizing human-centric design in automation technologies to minimize adverse impacts on jobs and society.
- iv) Regulating collection and use of personal data by technology companies to prevent infringement of privacy.



- v) Promoting algorithmic transparency, accountability and oversight in public sector AI deployment.

Data Privacy and Security

- i) Robust data protection laws safeguarding individual privacy and preventing data misuse.
- ii) Policies mandating data localization and restrictions on cross-border data flows for sensitive information.
- iii) Strengthening cybersecurity infrastructure and capabilities to secure critical systems and data.
- iv) Institutional mechanisms for auditing algorithms and enhancing transparency in AI systems.
- v) Governance frameworks to balance innovation, privacy, security and public good.

Public-Private Partnerships

- i) Platforms for collaborative research on emerging technologies between industry and academia.
- ii) Incentives for private sector to adopt and co-develop technologies that address development goals.
- iii) Knowledge sharing networks and testbeds enabling pilot deployments and validation of innovations.
- iv) Tech talent development through private sector mentoring, internships and vocational training.

Promotion of Entrepreneurship

- i) Seed funding, incubation and mentorship for early stage tech startups.
Mechanisms like regulatory sandboxes to test and refine tech solutions.
- ii) Initiatives to improve access to capital for tech entrepreneurs through loans, equity financing.
 - Networking platforms connecting entrepreneurs, investors, domain experts to catalyze innovation.
 - Targeted skill development programs on technology entrepreneurship and commercialization.

Conclusion

In conclusion, the Viksit Bharat agenda's recognition of emerging technologies as a force multiplier for India's growth and global standing is both timely and visionary. By harnessing its digital strengths and embracing innovation, India has the opportunity to become a trailblazer in the digital age, shaping the future of technology and cementing its position as a global leader.

The Viksit Bharat agenda presents a historic opportunity for India to utilize the transformative potential of emerging technologies to attain the vision of becoming a leading developed economy and global power by 2047. Realizing the agenda's ambitious targets across infrastructure, manufacturing, innovation, energy security



and quality of life will require harnessing the synergies of key technologies like AI, blockchain, 5G/6G and quantum computing.

India boasts favorable endowments including a vast IT-skilled talent pool, rapidly growing startup ecosystem, and policy prioritization of digitalization that can be leveraged to become a frontrunner in next-generation technologies. Strategic initiatives in research, commercialization, governance frameworks and international collaboration are imperative to build robust innovation ecosystems in emerging tech domains. Equally vital are steps to promote responsible development and prevent monopolization risks.

If fully actualized, India's technology edge in AI, advanced telecoms, blockchain and quantum can significantly amplify its hard and soft power advantages. India is poised to play a prominent role in shaping ethics, standards and norms around emerging technologies. Its partnerships and platforms like the Quad, I2U2 also underscore the geopolitical significance of India's technology capacities. Viksit Bharat's emphasis on deploying emerging technologies to attain national development priorities can elevate India's standing as a model for context-specific innovation in the Global South.

In conclusion, the thoughtful translation of India's digital strengths into strategic influence through ethical leadership in emerging technologies will be pivotal to realizing its great power ambitions. With the right strategies and policies prioritized under the forward-looking Viksit Bharat agenda, India is well-positioned to leverage technological change for national growth and cement its place as a leading shaper of the 21st century global technology order.

References

- Department of Science and Technology. (2020). Quantum Technology & Applications. Technology Information, Forecasting and Assessment Council.
- Draft India Data Accessibility and Use Policy 2022. Ministry of Electronics and IT. Mohan, C.R. (2021). *The India Way: Strategies for an Uncertain World*. HarperCollins India.
- Ghoshal, D. (2021). India can be a global satellite launching hub by 2047. Observer Research Foundation
- Kugelman, M. (Ed.). (2022). *India's Technological Rise: From Obscurity to Cyber Power*. Stimson Center.
- Menon, S. (2021). Geopolitics of technology key to India's rise. *The Tribune*.
- Menon, S. (2021). Geopolitics of technology key to India's rise. *The Tribune*.
- Ministry of Electronics and IT (2022). *India's Trillion Dollar Digital Opportunity*.
- Ministry of External Affairs. (2021). *India's Techade: Digital Governance in a Post-Pandemic World*. Government of India.
- Mohan, C. R. (2021). *Planning for India@2047: Hard and Soft Power Drivers*. ORF Special Report No. 134, Observer Research Foundation.
- NITI Aayog (2022). *Fifth National Report on the Implementation of SDGs*.
- NITI Aayog. (2018). *National Strategy for Artificial Intelligence: #AIforAll*. NITI Aayog, Government of India.
- Padmanabhan, A. (2021). *India's Emerging Technology Strategy in the Global Order*. ORF Issue Brief No. 514, Observer Research Foundation.



- Padmanabhan, A. (2022). Building an Indian century through techade. Financial Express Chakravorti, B. & Chaturvedi, R.S. (2017). Digital planet 2017: How competitiveness and trust in digital economies vary across the world. Tufts University.
- Pande, A. (2021). The Big Tech Revolution: Indian Telecom's Tryst with Destiny. HarperCollins India.
- Subramanian, S. (2022). Preparing India for the AI revolution. Observer Research Foundation.
- Tellidis, I. & Kapur, S. P. (2020). India in the Emerging Global Technology Order. Carnegie Endowment for International Peace.
- Viksit Bharat 2047: Unleashing the Power of Technology to Achieve India's Vision. (n.d.) retrieved March 2, 2024, from pune.news
- Viksit Bharat@2047: Navigating Development Through Technological Innovation. (n.d.) retrieved March 2, 2024, from www.linkedin.com
- Subramanian, S. (2022). Preparing India for the AI revolution. ORF.
- Whalan, J. (2021). A human-centric approach to AI in India: The role for ethics. Brookings India Impact Series No. 03221.