



Role of Science and Technology in Building Viksit Bharat: Vision 2047

Tamali Banerjee

Assistant Teacher (Physics), Sree Sarada Ashrama Balika Bidyalaya, *Success.Tamalee@Gmail.Com*

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ABSTRACT

Science and Technology (S&T) play a transformative role in building a self-reliant and globally competitive India. In the context of Viksit Bharat@2047, the strategic application of S&T is crucial for driving sustainable growth, social equity, and economic prosperity. This theoretical study explores how advancements in artificial intelligence, renewable energy, biotechnology, digital infrastructure, space research, and agriculture are enabling India to address key developmental challenges. From improving medical imaging and radiation therapy in healthcare to optimizing crop monitoring through remote sensing technologies, physics-driven innovation is central to inclusive development. The digital transition from Web 1.0 to Web 3.0—and the emergence of Web 4.0—reflects a shift toward intelligent, decentralized, and user-centric technologies, transforming governance, education, and public service delivery. Integration of technology in rural development is bridging socio-economic divides and fostering transparency, efficiency, and grassroots empowerment. India's push for *Atmanirbhar Bharat* is underpinned by robust innovation ecosystems, public-private partnerships, and progressive policies like the National Education Policy 2020 and the National Mission on Interdisciplinary Cyber-Physical Systems. The National Youth Policy 2023 also envisions a decade-long roadmap to empower youth for sustainable development through skills, innovation, and active participation in nation-building. Fostering scientific temperament, investing in R&D,



and promoting STEM education remain foundational for achieving Viksit Bharat. Ultimately, S&T is not merely a tool for modernization, but a cornerstone for building a resilient, innovative, and equitable India poised for global leadership.

INTRODUCTION

Development can be defined as a series of orderly growth towards a better tomorrow which indicates the change in the quality and character rather than its quantitative aspects. It is a continuous process. Govt. of India envisions a comprehensive roadmap to achieve the mission and vision of transforming India into a modernized and prosperous entity by 2047 to celebrate India's 100th year of independence. If we break down the word "INDIA", we find that development and progress lie within it; symbolizing a nation built on – Innovation, New ideas, Development, Inclusivity and Aspiration. The developed India, as we have dreamt of is not possible without the active support of advancement of science and technology. The science and technology are one of the main driving forces behind the success of any developed country. According to Britannica (2025), "*science, any system of knowledge that is concerned with the physical world and its phenomena and that entails unbiased observations and systematic experimentation. In general, a science involves a pursuit of knowledge covering general truths or the operations of fundamental laws.*" The fundamental information and comprehension of natural events are provided by science, and the practical application of this knowledge to create instruments, systems, and solutions that enhance human life is known as technology. They work together to promote economic growth, social justice, and environmental stewardship by embodying the qualities of creativity, problem-solving, efficiency, and sustainability. In the framework of India's 2047 vision, science and technology are essential to tackling the country's many developmental problems, which include infrastructure, governance, energy, healthcare, and agriculture, while also promoting inclusive growth and digital empowerment. A fully self-reliant, resilient, and globally competitive India that embodies the spirit of Viksit Bharat requires the synergy between scientific research and technology innovation along with strong governance, leadership and vision.

RATIONAL OF THE STUDY:

The purpose of this study is to investigate how science and technology are essential to India's aspirational goal of being a developed country by 2047, the year of its 100th anniversary of independence. Realizing the Viksit Bharat vision requires an understanding of how technology and scientific developments can be



properly matched with national development objectives. In order to make sure that these potent instruments adequately address India's social, economic, and infrastructure issues while fostering inclusive growth and sustainability, it is necessary to critically assess current government initiatives, policies, and scholarly viewpoints. Additionally, this study demonstrates the inherent connections between science, technology, and holistic development, showing how their combination not only promotes economic advancement and innovation but also social justice, digital empowerment, and global competitiveness, laying the groundwork for a resilient and future-ready India.

Despite significant scientific and technological progress in recent decades, India still has difficulties converting these discoveries into inclusive, sustainable growth for all facets of society. The ambitious goals set forth in national policies and their successful implementation at the local level differ significantly. Furthermore, a significant portion of the population frequently cannot access the advantages of technological advancement, particularly in rural and neglected populations. Furthermore, not much research has combined the nation's present technological capabilities with an eye toward the future, especially when considering the Viksit Bharat 2047 vision. It is essential to critically assess how science and technology may be best utilized to close these gaps and promote equitable growth, innovation, and national resilience in order to create a thorough and workable development plan for India's centennial year of independence.

STATEMENT OF THE PROBLEM:

The present study is stated as “Harnessing Science and Technology for Viksit Bharat: Blueprint for Vision 2047.”

OBJECTIVES OF THE STUDY

1. To study how science and technology have contributed to India's progress.
2. To study the role of National youth policy in promoting youth empowerment and the prerequisites for inclusive development to create Viksit Bharat.
3. To study the role of technological advancements through the evolution of the web to create Viksit Bharat and the initiatives taken by the government in the context of holistic development.



RESEARCH QUESTIONS

1. What are the key growth sectors in India's current development landscape, and how do they align with the goals of Viksit Bharat by 2047?
2. How does education and scientific research contribute to India's transformation into a developed nation, and what strategic areas need reinforcement for Vision 2047?
3. In what ways does the National Youth Policy promote youth empowerment and inclusive development, particularly through ensuring women's safety, in the context of building Viksit Bharat?
4. How have technological advancements, especially through the evolution of the web, contributed to holistic national development, and what role do government initiatives play in this transformation?

METHODOLOGY:

This paper adopts a descriptive research methodology, utilizing qualitative analysis of secondary sources such as government reports, policy documents, and scholarly articles. It aims to systematically explore the role of science and technology in shaping the vision of Viksit Bharat by 2047 through thematic categorization and contextual interpretation. This overview-style approach aims to highlight how scientific advancements and digital progress can pave the way toward a robust, resilient, and future-ready India.

Now, we discuss the findings based on the stated objectives below.

PRESENT STATUS OF INDIA'S GROWTH SECTORS

In this section we are trying to highlight the present situation in the field of: Indian economy and rate of employment, education, digital infrastructure, healthcare, Space and `Defense, green energy resources.

- **Indian Economy and Rate of Employment**

Presently the fourth-largest economy in the world, India's economy is expected to expand by 6.8% by 2025. India's economy continues to demonstrate resilience in 2025, with GDP growth projections ranging between 8% to 8.3%, driven by strong domestic consumption, government reforms, and a robust services sector (IndBiz, 2024). Key sectors like information technology, pharmaceuticals, and engineering goods are witnessing strong growth, contributing significantly to export revenues. Despite challenges posed by global inflation and shifting trade relations, India is positioning itself as a hub for



digital and green technologies, with increasing investments in renewable energy and the startup ecosystem (Ministry of Commerce & Industry, 2025). The government is focused on boosting manufacturing through initiatives like "Make in India" and increasing foreign direct investment to sustain economic growth (Reuters, 2025). The Indian labour market (Ministry of Labour and Employment, 2025) has shown strong improvement in recent years, with the unemployment rate dropping to 3.2% in 2023–24 and female labour force participation rising to 41.7%. There is significant growth in formal job creation, youth employment, and self-employment, supported by government schemes and digital platforms like e-Shram. However, wage growth has not kept pace with corporate profits, raising concerns about income inequality. The government is focusing on skill development, flexible labour laws, and promoting sectors like digital and renewable energy for sustainable employment.

- **Current Status of Education in India**

The Indian education system, serving over 248 million students across 1.47 million schools, is undergoing major reforms under the National Education Policy (NEP) 2020 (Ministry of Education, 2023). While enrollment at the primary level remains high at 93%, challenges such as increasing dropout rates at the secondary (14.1%) and higher secondary (45.6%) levels persist (Ministry of Education, 2024). Moreover, the digital infrastructure in schools has improved, with internet access rising from 22.3% to 53.9% between 2019 and 2024. The dropout rates have declined to 1.9% at the primary level, 5.2% at the upper primary level, and 14.1% at the secondary level, reflecting improvements in retention (Press Information Bureau, 2024). Digital infrastructure has seen significant enhancements, with the percentage of schools having computers increasing from 38.5% in 2019-20 to 57.2% in 2023-24, and internet facilities rising from 22.3% to 53.9% during the same period (Press Information Bureau, 2024). Despite these advancements, challenges persist, including disparities in infrastructure across regions and the need for continuous teacher training to adapt to evolving educational demands (Press Information Bureau, 2024). However, rural schools continue to face significant disparities in resources, affecting the quality of education. The continued emphasis on rote learning and exam-centric assessments has hindered the development of critical thinking and practical skills (Ministry of Education).

- **Digital Infrastructure**

India's digital infrastructure is rapidly expanding, with the government working towards transforming the country into a digital powerhouse. The Digital India program aims to improve internet access across rural areas, while promoting digital services such as e-governance, financial inclusion, and education (Agrawal, Rao, & Agrawal, 2021). As a result, India has the potential to increase its economic value



from digital transformation fivefold by 2025, with emerging technologies like AI, blockchain, and IoT playing a key role (Agrawal et al., 2021). However, there remains a need to strengthen foundational sectors like semiconductor manufacturing and data centers to support this digital push. India's digital infrastructure is evolving with the introduction of 5G technology, promising faster internet speeds and improved connectivity, which will further enhance smart governance and e-governance initiatives (Press Information Bureau, 2024). The widespread adoption of the Unified Payments Interface (UPI) has transformed digital transactions, making financial services more accessible to the masses (Economic Times, 2025). As the digital infrastructure improves, there is a need to secure the communication channel. India's current cyber security landscape is evolving rapidly as the nation accelerates its digital transformation. The increasing reliance on digital platforms for business, governance, and education has made the country more vulnerable to cyber threats. To address these challenges, India has implemented several initiatives, such as the National Cyber Security Policy and the creation of the National Critical Information Infrastructure Protection Centre (NCIIPC). However, despite these efforts, the rise in cyber-attacks, particularly on government systems, financial institutions, and critical infrastructure, continues to be a major concern. The government and private sector are investing heavily in enhancing cyber security capabilities to protect India's digital future (Saraswat, 2019).

- **Health Care**

As of May 2025, India's healthcare sector is experiencing significant growth and transformation. The government has allocated approximately INR 99,859 crore for healthcare in the FY2025–26 budget, marking an 11% increase from the previous year (KPMG, 2025). Initiatives like the Intensified Special Non-Communicable Diseases (NCD) Screening Campaign aim to address rising health concerns, targeting individuals aged 30 and above for screenings (Ministry of Health and Family Welfare, 2025). Additionally, the Ayushman Bharat Health Account (ABHA) initiative has successfully registered over 73 crore accounts, enhancing access to healthcare services (MoHFW, 2025). The sector is also witnessing a surge in health tech job opportunities, with a 62% growth in healthcare hiring in March 2025, driven by technological advancements and increased demand for medical services (Times of India, 2025).

- **Space And Defense**

India's space and defense sectors are making significant strides, with the Indian Space Research Organization (ISRO) achieving key milestones such as the successful launch of the NVS-02 navigation satellite, improving the country's positioning system, NavIC (AP News, 2025). The integration of space



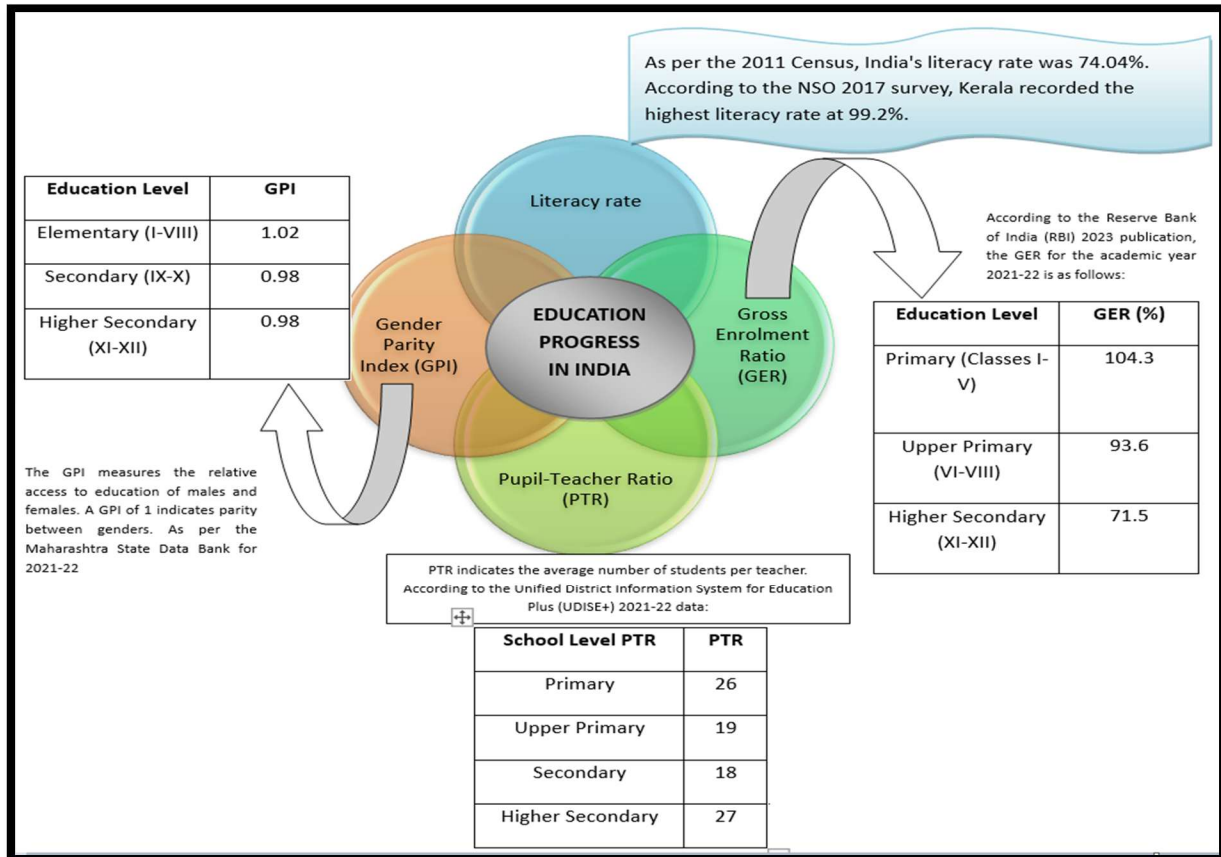
technology into defense systems is a priority, with the Indian government promoting private sector involvement in satellite manufacturing and launch services, thereby enhancing national security and reducing reliance on foreign providers (Financial Times, 2025).

- **Green Energy Resources**

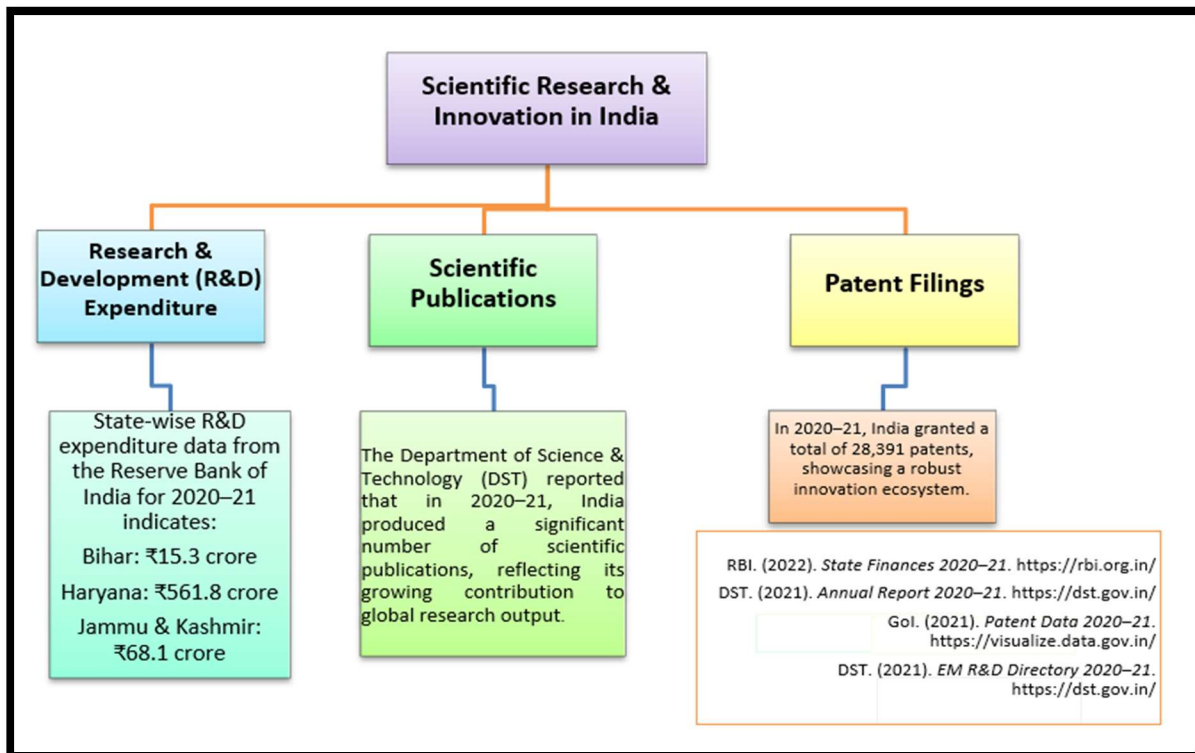
India's renewable energy sector is advancing steadily, with an installed capacity of 172,368.17 MW, which includes solar, wind, biomass, small hydro, and waste-to-energy sources (Ministry of New and Renewable Energy, 2025). The nation has set an ambitious target of reaching 500 GW of non-fossil fuel-based capacity by 2030 (Reuters, 2024). However, the industry faces challenges such as delays in project commissioning, land acquisition issues, and regulatory hurdles (Financial Times, 2025). In response, the government is focusing on promoting domestic manufacturing of solar components and investing in energy storage solutions to improve grid stability (Reuters, 2025).

THE CONTRIBUTION OF EDUCATION & RESEARCH TO CREATE VIKSIT BHARAT

Developing education and research is essential to create a "Viksit Bharat" (Developed India) by 2047. One important tactic has been found to be the promotion of STEM (science, technology, engineering, and mathematics) fields. With a heavy emphasis on STEM education, the National Education Policy (NEP) 2020 highlights the value of helping students develop their critical thinking and problem-solving abilities (Ministry of Education, 2020). Additionally, by promoting interdisciplinary learning and offering a flexible curriculum, the NEP seeks to promote research and innovation. Another significant program that encourages innovation and entrepreneurship is the Atal Innovation Mission (AIM), which was started by NITI Aayog. It fosters new ideas and gives young people a platform to participate in research and development (NITI Aayog, 2023). However, India must greatly boost its research and development (R&D) spending if it is to take full advantage of these potential. India's R&D spending is currently low by international standards; therefore, it is imperative that this investment be increased in order to foster innovation and the expansion of the research ecosystem (Bhat, 2022). In addition to improving India's technological prowess, strengthening the research environment will help the country reach its 2047 "Viksit Bharat" objective.



Key Indicators of Educational Progress in India



Status of Scientific Research and Innovation in India (2020-21)



NATIONAL YOUTH POLICY IN PROMOTING YOUTH EMPOWERMENT AND THE PREREQUISITES FOR INCLUSIVE DEVELOPMENT LEADING TO VIKSIT BHARAT

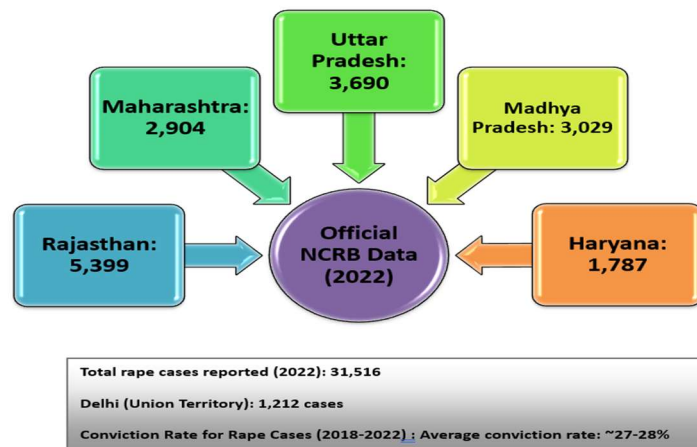
With a goal of creating a "Viksit Bharat" (Developed India) by 2047, the National Youth Policy (NYP) of India is a strategic framework designed to enable the youth to make a substantial contribution to the country's development. The five main focal areas listed in the policy—education, employment, entrepreneurship, leadership, and health—are crucial for maximizing the potential of the next generation. In order to promote critical thinking and problem-solving skills, the NYP supports the National Education Policy (NEP) 2020 by emphasizing access to high-quality learning and skill development. By promoting job creation and giving young people access to possibilities in the quickly changing global labour market, notably in fields like technology and renewable energy, the strategy places a strong emphasis on employment. Initiatives like the Atal Innovation Mission, which encourages young people to think creatively and adopt a startup culture, help entrepreneurship. Young leaders who can steer the country toward progress are fostered by the policy. Another top goal is health, which guarantees young people's wellbeing by facilitating better access to medical care and mental health assistance. Being at the forefront of digital transformation, artificial intelligence, and sustainable development, India's youth are vital to innovation and tech-driven change (NITI Aayog, 2023). In order to realize the goal of "Viksit Bharat" by 2047, their participation in these areas will be crucial.

- ***ENSURING WOMEN'S SAFETY: A PREREQUISITE FOR INCLUSIVE DEVELOPMENT***

India's goal of being a prosperous country by 2047 depends critically on ensuring the protection of its women. Sexual violence against women is still a major concern in spite of legislation changes like the Criminal Law (Amendment) Act, 2013. The National Crime Records Bureau (NCRB) recorded 31,516 rape cases in India in 2022, with an average of 87 occurrences each day. With 5,399 cases, Rajasthan was in first place, followed by Madhya Pradesh (3,029) and Uttar Pradesh (3,690). Delhi was the most dangerous metropolis for women, with 1,204 cases. Because of things like insufficient policing, court delays, and social stigma, the conviction rate for rape cases is still alarmingly below 30%. Utilizing science and technology is essential to solving this. Real-time monitoring and prompt aid can be improved by putting emergency response systems, mobile safety apps, and AI-driven surveillance into place. Additionally, data analytics helps pinpoint crime hotspots, allowing for more focused interventions. However, in order to promote a culture of equality and respect, technical solutions must be supported by strong legal frameworks, community involvement, and educational programs. In addition to

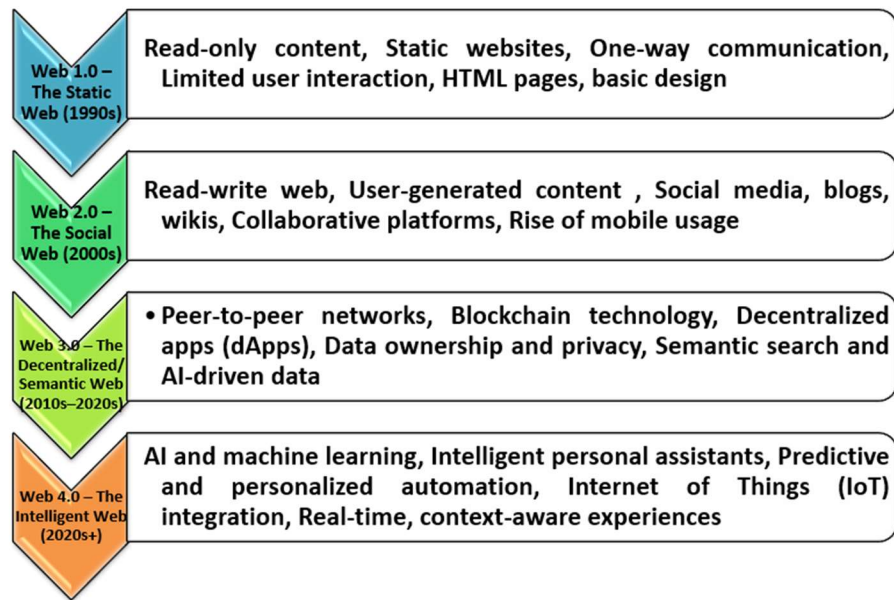


being morally required, putting women's safety first is crucial for inclusive development, which will enable women to fully participate in India's growth trajectory.



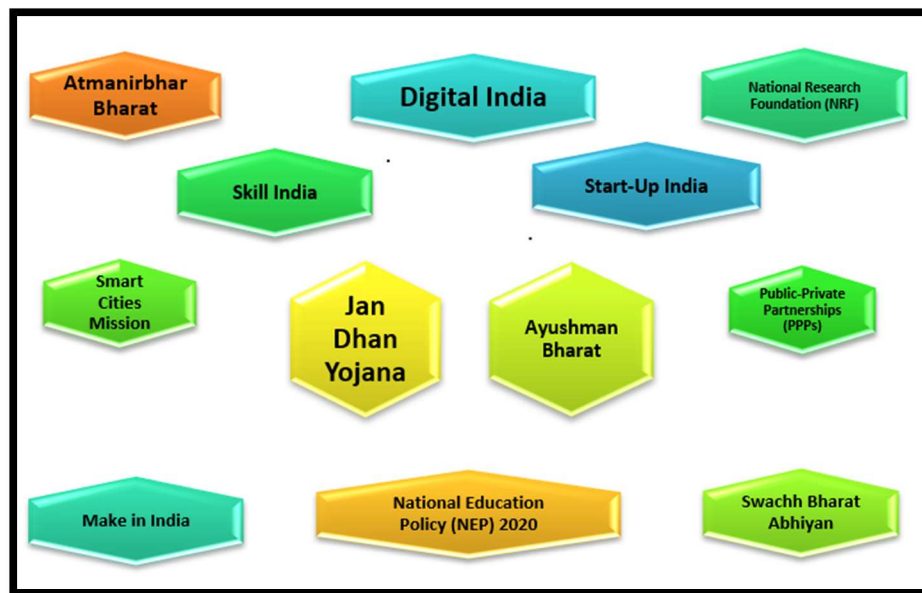
THE TECHNOLOGICAL ADVANCEMENTS THROUGH THE EVOLUTION OF THE WEB TO CREATE VIKSIT BHARAT AND THE INITIATIVES TAKEN BY GOVERNMENT IN THE CONTEXT OF HOLISTIC DEVELOPMENT

From Web 1.0 to Web 4.0, the web has seen incredible changes, with each phase signifying a change in technological prowess. Users could only consume material on Web 1.0, which was static and mostly consisted of one-way communication. Social media and other collaborative platforms grew as a result of Web 2.0's introduction of interactivity, which allowed users to produce and share content. The decentralized web, or Web 3.0, gives consumers more power and is centred on peer-to-peer networks, blockchain, and data privacy. Intelligent automation, which combines machine learning and artificial intelligence to create efficient and customized online experiences, is what defines Web 4.0. These developments have had a major impact on India's digital development, especially through programs like Digital India and the rising use of mobile internet. It is anticipated that Web 3.0 and Web 4.0 will spur more advancements, increasing access to intelligent systems and decentralized apps that have the potential to revolutionize industries like healthcare, education, and government (Basu, 2023).



INITIATIVES TAKEN BY GOVERNMENT IN THE CONTEXT OF HOLISTIC DEVELOPMENT

Numerous government programs and policies are a major factor in India's progress towards achieving a Viksit Bharat (Developed Nation) in 2047. By encouraging e-governance, digital literacy, and cybersecurity, initiatives like as Digital India seek to improve the nation's digital infrastructure and make technology available to all residents (Ministry of Electronics and Information Technology, 2020). Launched in 2016, Start-Up India has established an ecosystem that encourages entrepreneurship and innovation by offering tax breaks, financial assistance, and simplified regulatory procedures for start-ups (Ministry of Commerce & Industry, 2016). By promoting innovation, investment, and skill development, especially in fields like military, electronics, and renewable energy, the Make in India campaign seeks to establish India as a global center for manufacturing (Ministry of Commerce & Industry, 2014). Furthermore, a historic program that aims to better the coordination of academic and industrial research efforts and boost funding for India's research ecosystem is the National Research Foundation (NRF), which was established in 2020 (Department of Science & Technology, 2020). PPPs, or public-private partnerships, are essential for advancing these projects, especially in sectors like healthcare, education, and infrastructure. By ensuring that these initiatives are in line with national interests, effective regulation upholds sustainability and inclusion in the country's development objectives.



Government Initiatives for Holistic Development

CONCLUSION

Effective laws and regulations are necessary, but their implementation depends on everyone's collaboration, honesty, and perseverance. Having policies in place is not enough; what matters most is their continuous and sincere application. Building a solid foundation in education, digital literacy, and infrastructure will be the primary focus of India's development over the next several decades (2025–2030). Biotechnology, green energy, and artificial intelligence advancements will then accelerate growth (2030–2040), and by 2047, the country will be a global leader in technology. India's growth will be supported by science and technology, which will propel innovation, economic advancement, and global leadership. This vision, which is supported by programs like the National Tech Literacy Mission, Open Science Cloud, AI-enabled governance, and youth innovation competitions, places a strong emphasis on sustainable practices, inclusive development, and youth empowerment. Research, entrepreneurship, and innovation in a variety of fields will be promoted by the strategic alignment of flagship initiatives like Digital India, Start-Up India, and the National Education Policy 2020. Together with strong government assistance and productive public-private partnerships, India's youthful vitality will guarantee that the country not only makes technological strides but also maintains its competitiveness on a global scale. India can achieve its goal of becoming a technologically advanced, sustainable, and independent country by 2047. India will surely become a worldwide leader that embodies growth, resiliency, and teamwork



via cooperation, R&D investment, and innovation promotion. There has never been a more promising outlook for Viksit Bharat.

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