

## FROM CLASSROOMS TO CHANGEMAKERS: HIGHER EDUCATION AS A CATALYST FOR SUSTAINABLE TECHNOPRENEURSHIP

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### **Abstract**

*The intersection of higher education, sustainable development, and technopreneurship represents one of the most critical frontiers of the 21st century. This paper examines how universities and management institutes can evolve beyond conventional academic boundaries to become catalysts for technology-driven entrepreneurship. Drawing on the frameworks of Industry 5.0, the National Education Policy 2020 (NEP-2020), and the United Nations Sustainable Development Goals (SDGs), the study proposes an integrated roadmap that enables higher education institutions to systematically nurture technopreneurs—individuals who combine technological expertise with entrepreneurial acumen and a commitment to sustainability. The paper analyses five pillars: sustainable academic ecosystems, innovation and incubation infrastructure, skill development for a digital economy, SDG-aligned education, and inclusive technopreneurship. Empirical trends from India's startup and patent filing growth (2015–2024) are presented alongside a conceptual ecosystem model. The findings suggest that strategic alignment between policy, pedagogy, and practice is essential for transforming graduates into future-ready changemakers.*

**Keywords:** *Higher Education, Sustainable Development, Technopreneurship, NEP-2020, Industry 5.0, SDGs, Innovation Ecosystem*

### **1. Introduction**

The global knowledge economy of the 21st century demands a new breed of graduates — not merely skilled employees, but visionary creators who can harness technology for societal good. Higher education institutions (HEIs) stand at the epicentre of this transformation. As the world grapples with climate change, inequality, and rapid digital disruption, universities are being called upon to redefine their purpose: from disseminators of knowledge to engines of sustainable innovation.

India's higher education system, with over 1,000 universities and 40,000+ colleges, occupies a unique position in this global transformation. The National Education Policy 2020 (NEP-2020) marks a watershed moment, emphasising multidisciplinary learning, research excellence, and the entrepreneurial mindset. Simultaneously, the United Nations' 2030 Agenda for Sustainable Development provides a moral compass, anchoring education within the broader mission of ecological preservation and social equity.

The concept of 'technopreneurship' — the fusion of technology and entrepreneurship — emerges as a powerful paradigm for bridging higher education with real-world impact. A technopreneur is not merely a startup founder; they are an innovator who applies emerging technologies to solve pressing problems, creates scalable enterprises, and contributes to sustainable development. This paper

proposes a structured roadmap through which HEIs can systematically cultivate such individuals.

### **2. Review of Literature**

Scholars have consistently noted the evolving mandate of universities in innovation ecosystems. Etzkowitz and Leydesdorff (2000) introduced the Triple Helix model, illustrating how academia, industry, and government interact to generate innovation. Subsequent scholars extended this to a Quadruple Helix by including civil society, reflecting the growing emphasis on social sustainability (Carayannis & Campbell, 2009).

In the Indian context, the All India Council for Technical Education (AICTE) has progressively mandated entrepreneurship development programmes (EDPs) across affiliated institutions. Studies by the Confederation of Indian Industry (CII) reveal that institutions with active incubation centres produce significantly more patent filings and market-ready innovations than those without. The StartupIndia Initiative (2016) further catalysed a shift, with university-linked startups growing by over 1,100% between 2016 and 2024.

Research in sustainability-oriented education highlights that learners exposed to SDG-focused curricula demonstrate higher civic engagement, environmental consciousness, and social entrepreneurship intent (Wiek et al., 2011). Industry 5.0 literature emphasises human-centric, resilient, and sustainable industrial systems — a

paradigm shift that requires graduates with both technical competence and ethical awareness (European Commission, 2021).

**3. Objectives of the Study**

- To examine the role of higher education in fostering sustainable development and technopreneurship.
- To identify key pillars of a technopreneur ecosystem within Indian universities.
- To analyse the alignment of HEIs with the United Nations SDGs.
- To propose an evidence-based roadmap from higher education to technopreneurship.
- To evaluate the impact of NEP-2020 and Industry 5.0 frameworks on skill development.

**4. Five Pillars of a Technopreneur-Ready Higher Education System**

**4.1 Sustainable Academic Ecosystems**

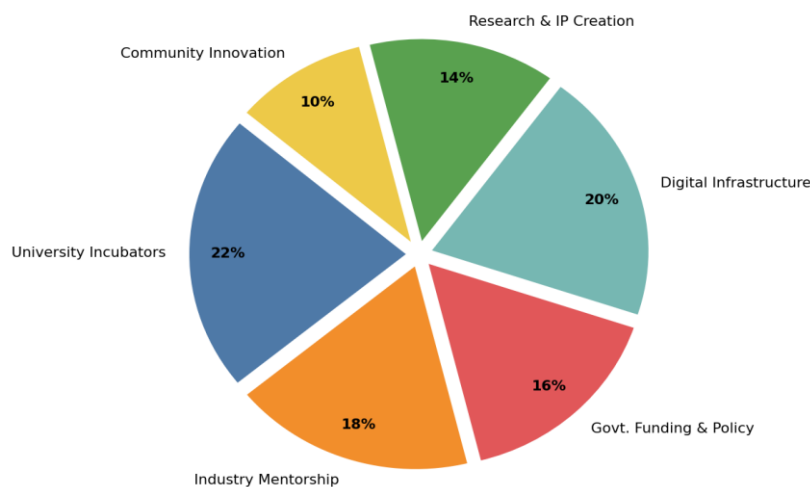
A sustainable academic ecosystem transcends the physical infrastructure of green campuses. It encompasses governance structures, faculty development, curriculum design, and community engagement strategies aligned with sustainability

principles. NEP-2020 advocates for holistic and multidisciplinary education, urging institutions to break disciplinary silos and create integrated learning environments. Green campus certifications, renewable energy adoption, and waste management policies serve as operational models for sustainability education, embedding environmental consciousness into the daily institutional culture.

**4.2 Technopreneurship & Innovation Infrastructure**

Innovation labs, design thinking studios, fabrication centres (FabLabs), and startup incubators form the hardware of a technopreneur ecosystem. However, the software — mentorship networks, seed funding mechanisms, intellectual property (IP) management policies, and industry-academia bridges — is equally critical. Successful models from IITs, NITs, and management institutions demonstrate that structured incubation with milestone-based support dramatically increases startup survival rates beyond the critical three-year threshold.

**Technopreneur Ecosystem Components in Higher Education**



*Figure 1: Technopreneur Ecosystem Components in Higher Education*

**4.3 Skill Development and Future-Ready Education**

The digital economy demands competencies that traditional curricula often fail to deliver: computational thinking, AI literacy, data analytics, cybersecurity, and human-centred design. NEP-2020's emphasis on vocational integration and credit transfer systems enables institutions to embed these competencies without sacrificing academic rigour. The entrepreneurial mindset — characterised by resilience, creative problem-solving, and opportunity recognition — must be cultivated through experiential learning

methodologies such as project-based learning, hackathons, and live industry consultancy.

**4.4 SDG-Aligned Education and Social Responsibility**

Aligning curricula with the 17 SDGs transforms education from a private good into a public investment. Courses on climate finance, circular economy, social entrepreneurship, and ethical AI directly connect classroom learning with global challenges. The following chart illustrates how Indian HEIs are currently aligned with key SDGs relevant to education and innovation.

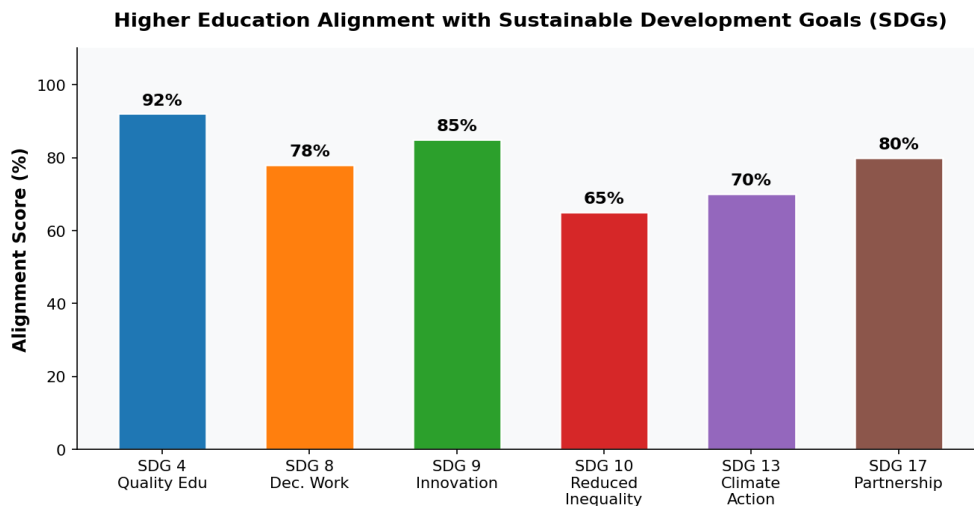


Figure 2: Higher Education Alignment with Key Sustainable Development Goals (SDGs)

As seen in Figure 2, alignment with SDG 4 (Quality Education) is highest at 92%, while SDG 10 (Reduced Inequalities) presents the greatest opportunity for improvement at 65%. This underscores the need for more inclusive admission policies, rural outreach programmes, and gender-responsive technopreneurship initiatives.

**4.5 Inclusive Technopreneurship**

Inclusive technopreneurship ensures that the benefits of innovation are distributed equitably across gender, geography, and socioeconomic strata. Women technopreneurs, rural innovators, and marginalised communities remain underrepresented in startup ecosystems. Targeted

interventions — women entrepreneurship cells, rural innovation hubs, MSME linkage programmes, and financial literacy campaigns — are essential to democratise the innovation economy. Institutions like AIMBA, embedded in semi-rural Maharashtra, are uniquely positioned to model inclusive technopreneurship at the grassroots level.

**5. Empirical Trends: India's University Innovation Landscape**

The following figure traces the trajectory of university-linked startups and patent filings in India from 2015 to 2024, illustrating the accelerating momentum of academic innovation post-NEP-2020 and the StartupIndia initiative.

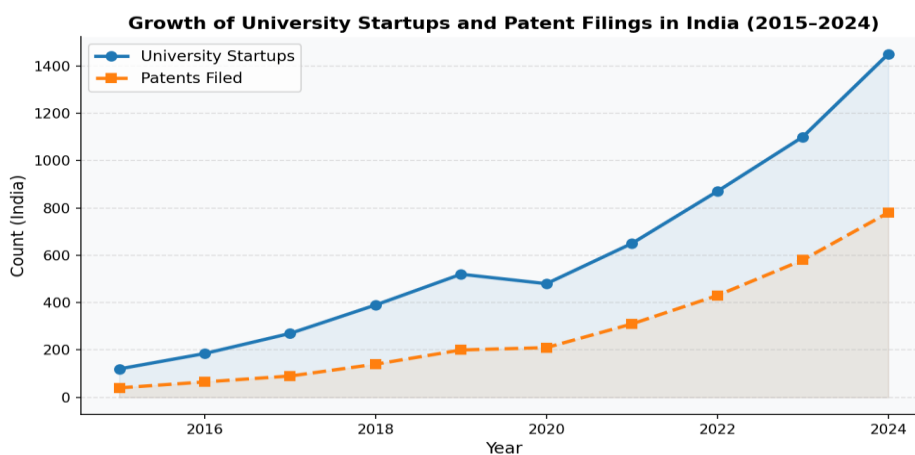


Figure 3: Growth of University Startups and Patent Filings in India (2015–2024)

The data reveals a compound annual growth rate (CAGR) of approximately 31% for startups and 38% for patent filings — numbers that reflect the combined effect of policy support, institutional readiness, and a maturing ecosystem. The temporary dip in 2020 is attributable to pandemic disruptions, followed by a strong rebound driven by

digital entrepreneurship and remote innovation ecosystems.

**6. A Proposed Roadmap: From Higher Education to Technopreneurship**

Based on the review of literature, empirical trends, and best practices, this paper proposes a five-stage sequential roadmap for HEIs aiming to systematically produce technopreneurs.

**Roadmap: From Higher Education to Technopreneurship**

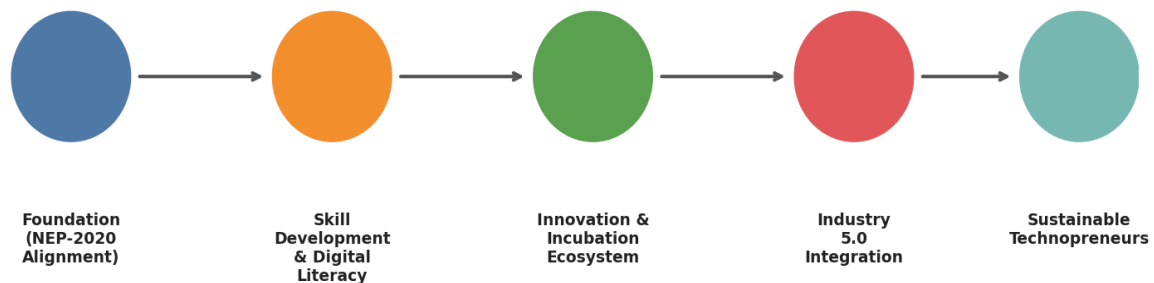


Figure 4: Proposed Roadmap — From Higher Education to Technopreneurship

The roadmap progresses through five interconnected stages:

- Stage 1 — Foundation (NEP-2020 Alignment): Institutional adoption of the NEP-2020 framework, curriculum redesign for multidisciplinary learning, and governance reforms to support an innovation culture.
- Stage 2 — Skill Development & Digital Literacy: Integration of AI, data science, design thinking, and entrepreneurial competencies across all programmes through blended and experiential learning.
- Stage 3 — Innovation & Incubation Ecosystem: Establishment of incubation

- centres, innovation labs, IP cells, mentorship networks, and seed funding mechanisms to bridge ideation and market entry.
- Stage 4 — Industry 5.0 Integration: Strategic partnerships with industry for co-creation, live projects, joint R&D, and technology transfer, anchored in human-centric and sustainable industrial principles.
- Stage 5 — Sustainable Technopreneurs: Graduation of graduates who are equipped to build sustainable, technology-driven enterprises that create economic value while advancing the SDGs.

**7. Policy Recommendations**

Government / UGC	Mandate SDG-aligned curricula in all HEIs; fund rural incubation centres	Increased sustainability literacy and equitable innovation access
Universities (SPPU, etc.)	Provide credit recognition for startups, patents, and social projects	Incentivised student and faculty innovation
HEIs / Institutes	Establish dedicated Innovation & Incubation Cells with IP support	Higher startup survival rates and patent commercialisation
Industry Partners	Invest in co-laboratories, sponsored research, and mentorship networks	Talent pipeline and R&D cost-sharing
Faculty	Undertake action research aligned with SDGs and Industry 5.0 themes	Publication output and real-world problem solving

**8. Conclusion**

Higher education stands at a defining inflection point. The convergence of NEP-2020, Industry 5.0, and the UN's SDGs presents an unprecedented opportunity — and obligation — for HEIs to reimagine their purpose. By systematically building

sustainable academic ecosystems, robust innovation infrastructure, inclusive opportunity structures, and policy-aligned curricula, universities can become the principal architects of a technopreneur generation capable of addressing the most pressing challenges of our time.

The roadmap proposed in this paper offers a structured yet adaptable framework for institutions of varying scales and contexts — from premier IITs to community-embedded colleges. The empirical data on India's startup and patent growth validates the directional trend; what remains is the commitment of institutions, policymakers, and industry to accelerate this transformation with intentionality and equity at its core.

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