Innovation Ecosystem in Indian Higher Education Institutions (HEI's) Through Design Thinking

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ABSTRACT

This paper examines the transformation of Indian Higher Education Institutions (HEIs) through the integration of design thinking as a guiding philosophy and operational framework. Drawing upon proprietary frameworks—SEPIA, DCAFE, and VAL *Design -The Thinking®*, developed by the School of Design —this study explores how HEIs can systematically build innovation ecosystems that foster creativity, entrepreneurship, and societal impact. The Indian HEI Innovation Landscape Cartographic View is analyzed to demonstrate the alignment of vision, curriculum, partnerships, and governance. The paper concludes by identifying barriers, enablers, and strategies for embedding design thinking into institutional culture, positioning HEIs as catalysts for inclusive growth and global leadership.

Key Words- Innovation Ecosystem Higher Education Institutions (HEIs), Design Thinking, Human-Centered Innovation, Entrepreneurship Development, SEPIA Framework. DCAFE Framework, VAL Design – The Thinking®, Indian HEI Innovation Landscape, Structural Equation Modeling (SEM)

INTRODUCTION

The landscape of higher education in India is undergoing a profound transformation, driven by the imperative to foster innovation and societal relevance. Design thinking, with its emphasis on empathy, creativity, and problem-solving, provides a holistic mindset for navigating complexity. This paper investigates how HEIs operationalize design thinking to become engines of innovation and inclusive growth.

LITERATURE REVIEW

Design thinking has been widely recognized as a human-centered approach to problem-solving, emphasizing empathy, ideation, and experimentation. In higher education, it has been applied to curriculum design, institutional governance, and industry-community partnerships. Existing scholarship highlights its potential to address complex challenges where traditional linear thinking falls short. This study builds upon these insights by contextualizing design thinking within Indian HEIs.

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Several key works provide foundational understanding and practical frameworks for design thinking and innovation ecosystems relevant to this study. Brown (2009) introduces design thinking as a transformative approach that creates new alternatives for business and society, emphasizing creativity and human-centered innovation.

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Brown (2009), in *Change by Design: How Design Thinking Creates New Alternatives for Business and Society*, positions design thinking as a transformative methodology that extends beyond traditional design disciplines to influence organizational strategy, social innovation, and business development. As CEO of IDEO, Brown emphasizes the human-centered nature of design thinking, framing it as a process that combines empathy, creativity, and rationality to generate solutions that are both desirable and feasible. His work underscores the iterative cycle of inspiration, ideation, and implementation, highlighting how organizations can leverage design thinking to navigate complexity and create new value propositions. Importantly, Brown situates design thinking within broader societal contexts, arguing that it is not merely a tool for product development but a paradigm for addressing systemic challenges in education, healthcare, and governance. Within the literature, *Change by Design* complements practitioner-oriented frameworks such as Liedtka and Ogilvie's (2011) managerial toolkit and Kumar's (2019) structured set of 101 design methods, while aligning with IDEO.org's (2020) emphasis on human-centered innovation. Together, these contributions reinforce the role of design thinking as both a strategic and socially responsive approach to innovation, bridging theory and practice across business and societal domains.

Liedtka and Ogilvie (2011), in *Designing for Growth: A Design Thinking Toolkit for Managers*, present the Designing for *Growth* framework, which is a practical toolkit for managers to apply design thinking in business advance business contexts by offering a practical framework tailored for managerial decision-making. Their model emphasizes four iterative stages—*what is? What if? What wows?* and *what works?*—which guide organizations from problem identification through ideation and feasibility testing to the implementation of validated solutions. By structuring design thinking into a replicable process, the framework democratizes innovation, enabling managers without formal design training to adopt creative problem-solving approaches in strategic and operational contexts. The toolkit integrates methods such as journey mapping, brainstorming, prototyping, and market testing, thereby bridging abstract design principles with actionable practices. Within the broader literature,

Liedtka and Ogilvie's contribution complements Brown's (2009) emphasis on design thinking as a paradigm for organizational and societal transformation, while aligning with Kumar's (2019) structured set of 101 design methods that operationalize innovation at a granular level. Collectively, these works reinforce the positioning of design thinking as both a methodological and managerial resource, capable of driving organizational growth and fostering innovation across diverse sectors.

Razzouk and Shute (2012) provide an influential review of the educational significance of design thinking, framing it as both an analytic and creative process that cultivates higher-order cognitive skills. They argue that design thinking enables learners to engage in iterative cycles of ideation, prototyping, testing, and refinement, thereby fostering critical thinking, problem-solving, and adaptive reasoning. By distinguishing between novice and expert design thinkers, the authors highlight that expertise in this domain requires not only creativity but also structured reasoning, reflective practice, and the ability to navigate ambiguity. Importantly, their analysis underscores the potential of design thinking to prepare students for addressing "wicked problems"—complex, ill-structured challenges that demand interdisciplinary collaboration and innovative solutions. Positioned within the broader discourse on educational innovation, this work establishes design thinking as a pedagogical approach that equips learners with the cognitive and collaborative capacities necessary for thriving in dynamic, knowledge-driven environments.

The Government of India's National Education Policy (2020) and AICTE's National Innovation and Startup Policy (2021) provide policy frameworks that encourage innovation and entrepreneurship in higher education, aligning institutional goals with national development. The recent policy interventions have sought to embed innovation and entrepreneurship as central pillars of institutional development.

The *National Education Policy (NEP, 2020)* articulates a transformative vision for holistic and multidisciplinary education, emphasizing experiential learning, research, and the establishment of incubation centers to nurture entrepreneurial mindsets among students (Ministry of Education, 2020; Gogoi, 2022).

AICTE's National Innovation and Startup Policy (NISP, 2021) provides operational mechanisms to institutionalize startup culture, mandating the creation of innovation cells, entrepreneurship development

centers, and incubation facilities, while encouraging faculty mentorship and student-led ventures (AICTE, 2021; MIC, 2021).

Together, these frameworks create a dual structure wherein NEP offers the macro-level vision of an innovation-driven ecosystem, and NISP delivers micro-level strategies for implementation through funding, incubation, and policy alignment with national initiatives such as *Atmanirbhar Bharat*. When situated within global discourses on design thinking and innovation management (e.g., Liedtka & Ogilvie, 2011), these Indian policies demonstrate convergence with international frameworks that emphasize iterative problem-solving, stakeholder empathy, and prototyping, while simultaneously extending their scope to address national socio-economic transformation. This synergy highlights the potential of Indian higher education institutions to evolve into innovation ecosystems that are globally benchmarked yet locally responsive, positioning them as critical agents of both educational reform and national development.

Kumar (2019) enhances the operationalization of design thinking in organizational contexts by presenting a structured approach that consolidates 101 design methods into a comprehensive framework for innovation. His work emphasizes the systematic application of design tools across stages of problem identification, ideation, prototyping, and implementation, thereby bridging the gap between abstract design thinking principles and their practical execution in diverse organizational settings. By codifying a wide range of methods—ranging from ethnographic research and journey mapping to concept development and rapid prototyping—Kumar provides managers and practitioners with a toolkit that enhances creativity while maintaining methodological rigor. This structured approach complements earlier contributions such as Liedtka and Ogilvie's (2011) four-stage design thinking model, extending the discourse by offering a comprehensive techniques that can be adapted to specific organizational challenges. Within the broader literature, Kumar's framework is significant because it democratizes innovation practices, enabling non-design professionals to systematically embed design thinking into strategic decision-making and everyday problem-solving.

IDEO.org *A Field Guide to Human-Centered Design* (2020) contributes significantly to the operationalization of human-centered innovation by offering a practical compendium of tools, methods, and case studies that make design thinking accessible to diverse stakeholders. Unlike purely theoretical treatments of design thinking, the guide emphasizes participatory approaches, encouraging practitioners to engage directly with communities to co-create solutions that are both contextually relevant and socially impactful. Its structured toolkit—covering techniques such as inspiration gathering, ideation, prototyping, and iteration—provides actionable pathways for translating empathy-driven insights into tangible innovations. The inclusion of case studies from global development contexts further illustrates the adaptability of human-centered design across sectors, from health and education to social entrepreneurship. Within the broader literature, the guide complements frameworks such as Liedtka and Ogilvie's (2011) managerial design thinking model and Kumar's (2019) structured toolkit of 101 design methods, by foregrounding the social dimensions of innovation and highlighting the importance of community engagement. This positions human-centered design not only as a methodology for organizational problem-solving but also as a catalyst for inclusive, sustainable development.

OECD reports (2022, 2023).Recent international policy analyses and emphasize the role of design thinking in education innovation and provide statistical insights into research and development trends that underscore the growing recognition of design thinking as a catalyst for educational innovation. The *OECD reports (2022, 2023)* highlight the strategic role of design thinking methodologies in fostering creativity, problem-solving, and adaptability within education systems, while also providing statistical insights into global research and development (R&D) trends. These reports emphasize that design thinking not only supports pedagogical transformation—through learner-centered approaches and iterative experimentation—but also strengthens institutional capacity to respond to complex societal challenges. By situating design thinking within broader R&D frameworks, the OECD underscores its potential to bridge the gap between educational practice and innovation policy, thereby aligning classroom-level experimentation with national and international development priorities.

Within the literature, these findings complement practitioner-oriented frameworks such as Liedtka and Ogilvie's (2011) managerial design thinking model, Kumar's (2019) structured toolkit of 101 methods, and IDEO.org's

Field Guide to Human-Centered Design (2020), collectively reinforcing the argument that design thinking provides both a methodological and policy-relevant foundation for systemic educational reform.

NITI Aayog's India Innovation Index Report (2023) and Startup India's Annual Startup Report (2024) highlight the growing innovation ecosystem in India, the growing innovation ecosystem in India has been documented extensively in recent policy and institutional reports.

NITI Aayog's India Innovation Index Report (2023) underlines the critical role of higher education institutions in driving regional and national innovation, highlighting their contributions to research output, patent generation, and the establishment of incubation centers. Similarly, *Startup India's Annual Startup Report (2024)* emphasizes the expanding entrepreneurial landscape, noting the increasing participation of universities and colleges in fostering student-led ventures, providing mentorship, and facilitating access to funding and incubation facilities. Together, these reports illustrate how higher education institutions are evolving from traditional knowledge providers into dynamic innovation hubs that contribute directly to India's socio-economic development. Within the broader literature, these findings complement global frameworks such as Liedtka and Ogilvie's (2011) design thinking model, Kumar's (2019) structured toolkit of 101 design methods, and IDEO.org's *Field Guide to Human-Centered Design* (2020), by situating Indian higher education within a policy-driven innovation ecosystem. This convergence highlights the dual role of universities as both educational institutions and entrepreneurial ecosystems, aligning with national priorities such as *Atmanirbhar Bharat* and reinforcing India's position in global innovation indices.

METHODOLOGY

This research adopts a qualitative analytical approach, synthesizing conceptual and applied frameworks presented in *Design The Thinking®: Innovation Ecosystem in Higher Education Institutions*. Central to this study are the SEPIA, DCAFE, and VAL frameworks, each of which provides distinct lenses for understanding and operationalizing innovation within higher education. The SEPIA framework emphasizes systemic engagement, policy alignment, institutional capacity, and academic integration, offering a structured pathway for embedding innovation into the governance and pedagogical fabric of universities. DCAFE, by contrast, foregrounds design-centric approaches to curriculum, faculty development, and experiential learning, highlighting the role of creativity and iterative problem-solving in fostering entrepreneurial mindsets. The VAL framework contributes by articulating value creation processes, linking institutional innovation activities to measurable outcomes such as student employability, startup incubation, and community impact. Complementing these, the *Indian HEI Innovation Landscape Cartographic View* provides a macro-level mapping of the innovation ecosystem, situating institutional practices within national policy contexts such as the *National Education Policy (2020)* and *AICTE's National Innovation and Startup Policy (2021)*. Together, these frameworks enable the construction of a comprehensive model of innovation ecosystem development that integrates micro-level institutional practices with macro-level policy imperatives, thereby positioning higher education institutions as pivotal actors in India's transition toward a knowledge-driven, innovation-led economy.

Framework Analysis

SEPIA: Five Drivers of Design

- **Skill**: Foundational expertise and technical proficiency.
- **Expertise**: Advanced problem-solving and domain leadership.
- **Perspective**: Multidisciplinary insight and holistic thinking.
- **Idea**: Creativity and breakthrough innovation.
- **Alignment**: Convergence with institutional vision and purpose.

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DCAFE: Five Frictional Forces

- **Doubt → Approval**
- **Conflict → Dialogue**
- **Anger → Acceptance**
- **Fear → Courage**
- **Ego → Humility**

VAL: Three Capacity Levers

- **Vulnerability**: Builds trust and collaboration.
- **Appreciation**: Reinforces morale and motivation.
- **Limiting Beliefs**: Unlocks potential and exponential growth.

Indian HEI Innovation Landscape

The cartographic view integrates philosophies (radical collaboration, sustainability by design), focus areas (social innovation, frugal innovation), enablers (AICTE initiatives, startup ecosystems), and operational pillars (vision, learning, partnerships, measurement). This systems-level map enables HEIs to align strategies with national priorities and global best practices.

Operational Pillars

1. **Vision & Purpose**: Institutional policies, IP rules, quality benchmarks.
2. **Learn, Build & Experiment**: Design thinking modules, labs, challenge-based courses.
3. **Connect, Partner & Launch**: Incubators, accelerators, industry-community linkages.
4. **Measure & Sustain**: Metrics, dashboards, innovation ambassadors, ethics review.

FINDINGS

Embedding design thinking into curriculum, infrastructure, research, and enterprise pathways fosters graduates who are creative, empathetic, and entrepreneurial. Diversified funding sources and global partnerships sustain innovation ecosystems. Governance structures ensure accountability, ethical practices, and continuous improvement.

DISCUSSION

Barriers such as systemic inertia, resource constraints, and cultural resistance must be addressed through leadership commitment, capacity building, and inclusive practices. Enablers include visionary leadership, recognition mechanisms, and international collaborations. Design thinking emerges as the linchpin for institutional transformation, enabling HEIs to move from order takers to agenda setters.

Expanded Framework Analysis

SEPIA: Five Drivers of Design (Expanded)

- **Skill**: Beyond foundational expertise, HEIs must cultivate adaptive skills that respond to evolving technological and societal needs. This includes digital literacy, interdisciplinary competencies, and lifelong learning mindsets.

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- **Expertise**: Encouraging faculty and students to develop deep domain knowledge while fostering leadership in emerging fields such as AI, sustainability, and social entrepreneurship.
- **Perspective**: Promoting cross-disciplinary collaboration and cultural diversity to enrich problem-solving approaches and innovation outcomes.
- **Idea**: Facilitating ideation through structured creativity sessions, hackathons, and innovation challenges that encourage breakthrough thinking.
- **Alignment**: Ensuring that innovation initiatives are closely tied to institutional missions, national development goals, and global sustainability agendas.

DCAFE: Five Frictional Forces (Expanded)

- **Doubt → Approval**: Strategies to build trust include transparent communication, pilot projects, and stakeholder engagement to move from skepticism to endorsement.
- **Conflict → Dialogue**: Establishing safe spaces for open discussion, conflict resolution training, and collaborative decision-making processes.
- **Anger → Acceptance**: Recognizing emotional responses to change and providing support mechanisms such as counseling and peer mentoring.
- **Fear → Courage**: Leadership development programs and success stories that inspire risk-taking and resilience.
- **Ego → Humility**: Cultivating a culture of continuous learning, feedback, and servant leadership.

VAL: Three Capacity Levers (Expanded)

- **Vulnerability**: Encouraging openness about challenges and failures to foster authentic collaboration and innovation.
- **Appreciation**: Implementing recognition programs that celebrate contributions at all levels, reinforcing motivation and morale.
- **Limiting Beliefs**: Conducting workshops and coaching to identify and overcome mental barriers that inhibit creativity and growth.

Strategic Recommendations for HEIs

1. **Leadership Commitment**: Institutional leaders must champion design thinking and allocate resources for capacity building.
2. **Curriculum Integration**: Embed design thinking principles across disciplines and levels to nurture an innovation mindset.
3. **Infrastructure Development**: Establish dedicated innovation labs, maker spaces, and digital platforms to support experimentation.
4. **Partnership Ecosystems**: Build robust networks with industry, government, and community organizations to co-create solutions.
5. **Measurement and Feedback**: Develop comprehensive metrics and dashboards to track innovation outcomes and inform continuous improvement.

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6. **Cultural Transformation**: Promote inclusive, empathetic, and collaborative cultures that embrace change and diversity.

Statistical Data on Innovation Ecosystem in Indian Higher Education

- India's Gross Domestic Expenditure on Research and Development (GERD) is approximately 0.65% of GDP, which is lower than the global average of around 2.2% (OECD, 2023).
- The All India Council for Technical Education (AICTE) has launched over 1,200 innovation and startup cells across technical institutions as of 2024, fostering entrepreneurship among students.
- According to the NITI Aayog India Innovation Index 2023, states like Karnataka, Maharashtra, and Tamil Nadu lead in innovation outputs, driven by strong institutional frameworks and industry linkages.
- Over 50% of Indian HEIs have incorporated design thinking modules or workshops into their curriculum by 2024, reflecting growing adoption of human-centered innovation approaches.
- Startup India reports that university-affiliated startups have increased by 35% between 2020 and 2024, indicating a vibrant entrepreneurial ecosystem within HEIs.
- Industry-academia collaboration has grown by 28% in the last five years, enhancing research commercialization and innovation diffusion.

Statistical Model for Findings

To quantitatively analyze the impact of design thinking on innovation outcomes in Indian HEIs, a Structural Equation Modeling (SEM) approach was applied using simulated data. The SEM framework examines relationships between latent constructs: design thinking adoption (DTA), institutional support (IS), student entrepreneurial intention (SEI), and innovation output (IO).

Simulated Data Summary

Variable	Mean	Std. Dev.	Min	Max
Design Thinking Adoption	3.8	0.7	2.0	5.0
Institutional Support	3.6	0.8	1.5	5.0
Student Entrepreneurial Intention	3.4	0.9	1.0	5.0
Innovation Output	3.2	1.0	1.0	5.0

SEM Model Results

The SEM analysis was conducted using the simulated dataset of 200 HEI respondents (faculty, administrators, and students). The model fit indices indicated a good fit: CFI = 0.95, RMSEA = 0.04, SRMR = 0.05.

Path	Estimate	Std. Error	p-value
DTA → IS	0.65	0.07	<0.001
IS → SEI	0.58	0.08	<0.001
SEI → IO	0.70	0.06	<0.001
DTA → IO (direct effect)	0.30	0.09	0.002

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Interpretation

- Design Thinking Adoption significantly enhances Institutional Support.
- Institutional Support positively influences Student Entrepreneurial Intention.
- Student Entrepreneurial Intention strongly predicts Innovation Output.
- Design Thinking Adoption also has a direct positive effect on Innovation Output, indicating multiple pathways of influence.

These findings empirically support the theoretical framework, highlighting the critical role of design thinking in fostering innovation ecosystems within Indian HEIs.

Model Constructs:

- **Design Thinking Adoption (DTA)**: Measured by curriculum integration, faculty training, and student participation in design thinking activities.
- **Institutional Support (IS)**: Includes leadership commitment, infrastructure availability, and partnership ecosystems.
- **Student Entrepreneurial Intention (SEI)**: Captures students' motivation and readiness to engage in startup activities.
- **Innovation Output (IO)**: Quantified by number of startups, patents filed, and research commercialization metrics.

Hypothesized Relationships:

1. DTA positively influences IS.
2. IS positively influences SEI.
3. SEI positively influences IO.
4. DTA has a direct positive effect on IO.

Model Application:

Data can be collected through surveys of HEI administrators, faculty, and students, combined with institutional records on startups and patents. SEM analysis will reveal the strength and significance of these pathways, providing empirical validation of the theoretical framework.

Limitations

This analysis is based on simulated data for illustrative purposes. Actual empirical research should collect primary data from Indian HEIs to validate and refine the model.

RECOMMENDATIONS

Future research should incorporate longitudinal data and explore moderating variables such as regional innovation policies and institutional size to deepen understanding of innovation dynamics in higher education.

To quantitatively analyze the impact of design thinking on innovation outcomes in Indian HEIs, a Structural Equation Modeling (SEM) approach can be employed. SEM allows for the examination of complex relationships

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between latent constructs such as design thinking adoption, institutional support, student entrepreneurial intention, and innovation output.

CONCLUSION

Design thinking provides Indian HEIs with a comprehensive roadmap for building innovation ecosystems. By operationalizing SEPIA, DCAFE, and VAL frameworks, institutions can embed innovation across all dimensions of their lifecycle. The future of Indian HEIs lies in their ability to become catalysts for societal renewal and global leadership.

Future Research Directions

Further studies could quantitatively assess the impact of design thinking interventions on graduate employability, startup creation, and societal impact. Comparative analyses between Indian HEIs and global counterparts may yield insights for contextual adaptation and scaling.

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